OMAHA DISTRICT - FY 1993 INTERIOR LEAST TERN AND PIPING PLOVER

PROGRAM SUMMARY

September, 1993

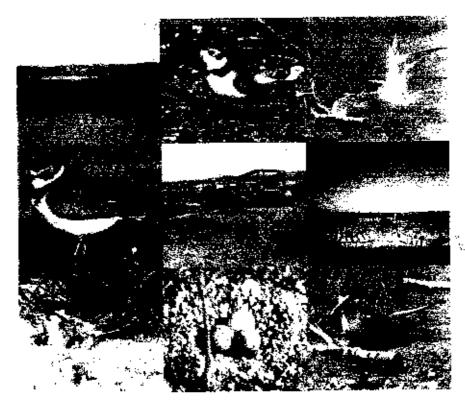




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I. PURPOSE OF THE PROGRAM SUMMARY

The Omaha District Corps of Engineers (District) has been involved in least tern and piping plover studies since the mid 1980's. The U.S. Fish and Wildlife Service increased actions following the issuance of a Biological Opinion (Opinion) on November 14, 1990. Initial District implementation of that Biological Opinion began in 1992, following the development of a one-year work plan. Full District implementation of the Biological Opinion began in 1993, after the development of an implementation plan, Omaha District's Fiscal Year 1993 - Fiscal Year 1995 Plan for Habitat Improvement for the Interior Least Tern and the Piping Plover, commonly known as the "Red Book." The Red Book was reviewed by the U.S. Fish and Wildlife Service and approved for implementation by the Missouri River Division of the Corps of Engineers (now the Missouri River Region, or Regions). Corps responsibilities under the Opinion lie within the Missouri River from Fort Peck Dam to Ponca, Nebraska, and the Missouri River Reservoirs (see Figure 1).

Although comprehensive annual "Summary of Studies" were initially written for agency review of Corps' tern and plover activities, the amount of data collected, the time commitment needed for summaries of this sort, and other year-round demands for staff have precluded the development of such reports during recent years. Survey and monitoring data, however, has always been summarized annually, as is required by the Opinion and the Service collection permit for such monitoring.

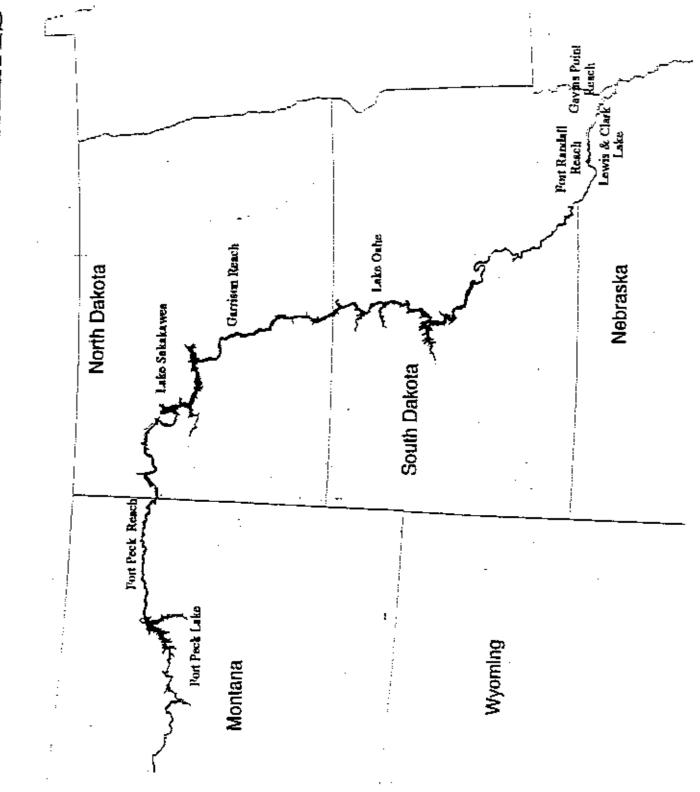
This 1993 Program Summary is a documentation of all activities within the least tern and piping plover program during 1993. These activities are summarized under the appropriate Opinion task for which the Omaha District has responsibility.

Information for the 1993 Program Summary was gathered from District personnel after-the-fact, but an attempt was made to be as complete as possible, and the document was internally reviewed by tern and plover supervisory personnel. If funding remains available, the District intends to develop Program Summaries for the years 1994 - 1996, as well as Program Summaries for future years.

The intent of the 1993 Program Summary is to demonstrate to interested agencies and Corps personnel that the Omaha District has met all of its obligations under the 1990 Biological Opinion during 1993.

MISSOURI RIVER STUDY AREAS

Figure 1: Missouri River Study Area



II. BACKGROUND INFORMATION

Biological Opinion

In 1985, the interior least tern was listed as an endangered species, and the piping plover was listed as a threatened species. In 1986, the Service requested that the Corps enter into formal consultation on the operation of the Missouri River Main Stem system and the impact of ongoing operations on federally listed species. Also in 1986, the Corps began funding studies to learn more about the interior least tern and the piping plover within the Missouri River system. In 1987, the Region prepared a Biological Assessment (BA) on the effects of the Missouri River Main Stem system on the least tern and piping plover. The BA concluded that reservoir releases could affect habitat for both the interior least tern and the piping plover (U.S. Army Corps of Engineers, 1987).

The BA was transmitted to the Service on October 19, 1987. On May 26, 1989, the Region requested the Service for a Biological Opinion on the operations of the Missouri River Main Stem System (System). The Services Biological Opinion (Opinion) resulting from this request was sent to the Region on November 14, 1990. The Opinion concluded that "the operations of the System are likely to jeopardize the continued existence of the endangered interior least tern (Sterna antillarum) and the threatened piping plover (Charadrius melodus) because operations eliminate essential nesting habitat and could result in the loss of at least 12 percent of the interior least tern population and 22 percent of the Northern Great Plains piping plover population..." The Opinion described Reasonable and Prudent Alternatives that could be implemented by the Corps to avoid jeopardizing the two species, Conservation Actions to assist in the recovery of the birds, and Reasonable and Prudent Measures to minimize or avoid the "taking" of terns or plovers or their habitat.

The Region transmitted the Opinion to the District by memorandum dated March 8, 1991, tasking the District to implement specific tasks outlined in the Opinion. Specifically, the District was directed to fund and implement Reasonable and Prudent Alternatives 1b, 1c, 2, 3, 4, 5, and 6; and Reasonable and Prudent Measures 1, 2, and 4. The Region subsequently took over Reasonable and Prudent Alternative 4, which involved the formation of a Tern and Plover Management Team. The Missouri River Natural Resources Committee (MRNRC) was already established as a team of state and federal entities that make annual recommendations in conjunction with the Annual Operating Plan (AOP) for the Missouri River. Therefore, the Region spearheaded the establishment of a Tern and Plover sub-committee to the MRNRC that would serve as the Tern and Plover Management Team for the purposes of the Opinion.

Summary of 1993 Weather and Hydrological Conditions

Rainfall during 1993 ended a 6-year drought in the lower the Missouri River basin. Reservoirs that had lower water levels and exposed shorelines, during the drought, rose in water elevation. What had been temporary nesting habitat went under water, leaving a vegetation-lined shoreline similar to "normal" conditions. Nests were flooded during this process, as well as in the river where inflow from swollen tributaries inundated low elevation islands. In response to the flooding, water releases from Fort Randall and Gavins Point dams were decreased to nominal levels, providing vast areas of sand for nesting upstream from incoming tributaries. Surveying and monitoring low water areas was difficult with standard survey boats.

1993 was marked also with catastrophic weather including hail, high winds, cold temperatures, and record precipitation resulted in the continued rise of the Missouri River systems reservoir level during the summer months. Heavy system wide precipitation, large tributary inflows, and rising reservoir elevations created unfavorable conditions for nesting and inundated all likely nesting and brooding habitat during this period.

Rainfall and cool weather dampened hopes for early spring herbicide use and vegetation burning. The majority of habitat work occurred in the late summer and early fall. Island areas that had been built to sustain a higher flow were heavily utilized.

Figure 2: Mountain Snow Pack in the Missouri River Basin 1992-1993

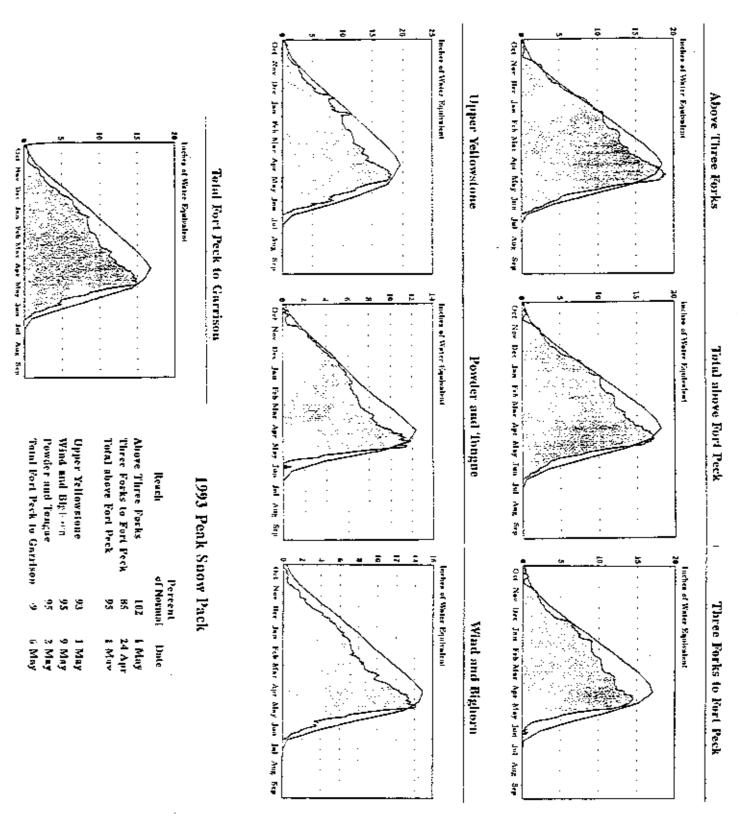
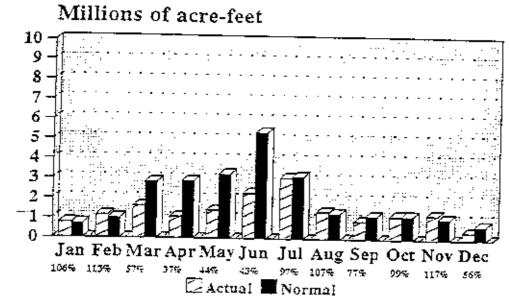
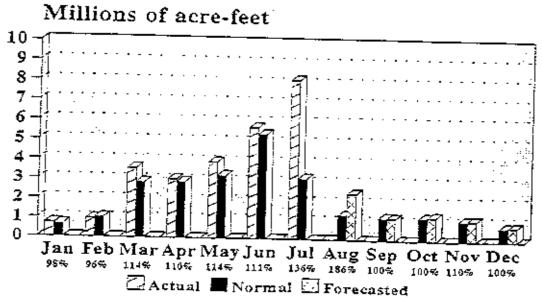


Figure 3: 1992 Annual Runoff Above Sioux City, IA



June 11, 1993 Total 1992 Actual runoff was 16,4 MAF

Figure 4: 1993 Annual Runoff Above Sioux City, IA



August 4, 1993 Total 1993 Estimated runoff is 32.6 MAF

Figure 5: Drought Severity (Long Term, Palmer) May 29, 1993 NOAA/USDA JOINT AGRICULTURAL WEATER FACILITY * Based on preliminary reports



Figure 6: Drought Severity (Long Term, Palmer) August 21, 1993
NOAA/USDA JOINT AGRICULTURAL WEATER FACILITY - Based on preliminary reports



Figure 7: Total Precipitation (Inches)

MAY 1993

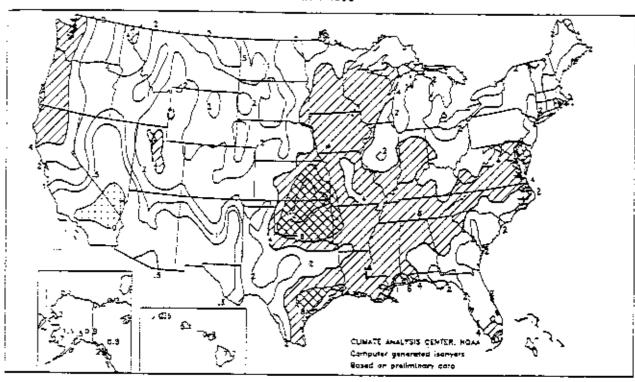


Figure 8: Total Precipitation (Inches)

JUN 1995

CLIMATE AMAYSIS CENTER, NOAA

Computer generated isolyment
Based se pretiminery date

Figure 9: The Great Flood of 1993

Missouri River Stage Comparisons at Selected Gages

Historic Flood 1993 w/o Reservoirs 1993 Actual Flood

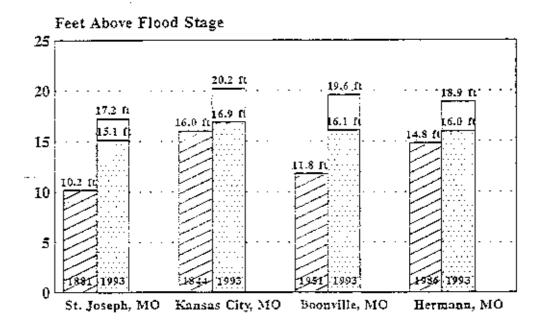
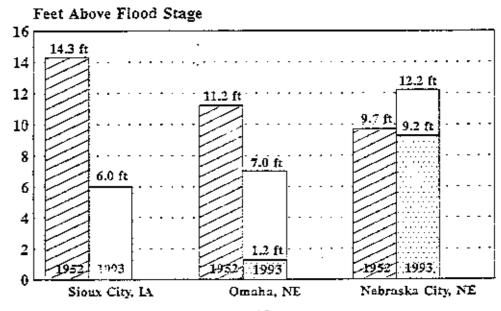


Figure 10: The Great Flood of 1993

Missouri River Stage Comparisons at Selected Gages

☐ Historic Flood ☐ 1993 w/o Reservoirs ☐ 1993 Actual Flood



III. DISTRICT IMPLEMENTATION OF THE BIOLOGICAL OPINION - 1993

The District was tasked by the Region to fund and implement most of the tasks outlined in the Opinion. Pertinent parts of the Opinion tasks are included as bold text below. The remaining tasks primarily relate to flows and therefore have been implemented by the Region. The re-initiation of consultation, should new information become available, is also the responsibility of the Region.

1. Reasonable and Prudent Alternatives - Omaha District Responsibilities

Reasonable and prudent alternatives are defined as alternative actions, identified during formal consultation, which can be implemented in a manner consistent with the intended purpose of the action. Alternative actions may be implemented consistent with the scope of the Federal Agency's legal authority and jurisdiction, which are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

- a. Natural nesting habitat should be provided as a priority and other management actions implemented to meet or exceed fledge ratio goals (i.e. 0.70 for terns and 1.44 for plovers). The Corps should, based in part on past years information, determine the habitat necessary for each river reach and provide management actions within the Corps authorities to meet or exceed fledge ratios. The Corps should use the following parameters when determining habitat and management actions needed to meet or exceed fledge ratios:
 - proximity to foraging habitat no greater than 400 meters from an area that provides schooling and feeding fish that are 3 inches in size
 - substrate consisting of very fine to fine sand for terms, and some gravel for plovers
 - vagetation should be no greater than 25 percent cover, with optimum cover at 10 percent or less
 - nesting areas should be 8 inches or greater in elevation above river levels
 - nesting should be substantially disturbance-free from both predation and human disturbance

Three sets of paired Schwimmenkampen floating modular units were installed at three locations in April of 1993. Units were placed on existing low-elevation islands, and sand was mounded on top of the islands, simulating natural contours. Along Lake Sakakawea, vegetation was burned on the Deepwater Bay Entrance Island during April 1993. Willows (5 - 15' tall) were cut down, and oyster shell

was experimentally placed on two locations. Vegetation was also removed by various modes (i.e. glyphosate-based aquatic herbicide, sickle mower, cutting woody saplings, and burning), along the Missouri River below Garrison, Fort Randall, and Gavins Point Dams, and within Lewis and Clark Lake.

b. When flows below main stem dams may inundate much nesting habitat, other means will be necessary to establish nesting habitat to meet fledge ratio goals. Created habitat should be established to accommodate the following release flows by river reach and to supplement natural habitat required by Alternative 1b above.

Fort Peck - - above 8,500 cfs and below 13,200 cfs Garrison - - above 18,000 cfs and below 31,000 cfs Fort Randall - - above 28,000 cfs and below 38,500 cfs Gavins Point - - above 30,000 cfs and below 39,500 cfs

Flows at Garrison, Fort Randall, and Gavins Point dams exceeded the flow window from May to August during 1993. Flows from May to August ranged as follows:

Fort Peck - - 8,000 - 12,000 cfs Garrison - - 18,500 - 30,000 cfs Fort Randall - - 16,800 - 37,000 cfs Gavins Point - - 27,000 - 32,000 cfs primarily within flow window primarily within flow window primarily within flow window primarily within flow window

When flows are below the flow windows, established in the Opinion, there should already be enough sand exposed for tern and plover habitat that year, but low water years may be ideal for creation of habitat to accommodate flows within the flow windows. When flows exceed the flow windows, it indicates an unusually wet year during which nesting everywhere (even uncontrolled rivers) is likely to be inundated. Even created high elevation habitat is at risk when the upper limits of the flow windows are exceeded.

High flows from the lower three dams during 1993 aided in scouring existing vegetation at elevations within the flow windows, and forming additional high elevation sandbar habitat for future years. In addition to flow-related incidental habitat creation, additional efforts for high elevation creation were accomplished. Below Fort Peck Dam, where flows were within the flow window during 1993, high elevation habitat was treated with herbicide on five sites in the upper end of Lake Sakakawea near the Yellowstone River confluence. This habitat provided escape cover for pre-fledged chicks in case discharges from the Yellowstone River inundated natural areas during the chick-rearing period.

c. The Corps should provide information on tern and plover management strategies during the development of the draft Annual Operating Plan in the fall and after March 1 when the runoff forecast is made.

Information on predicted 1993 tern and plover tasks was provided to the Region for inclusion in the 1992-93 AOP. Information on accomplished 1993 tern and plover

tasks was provided to the Region for inclusion in the 1993-1994 AOP. Drafts of both documents were sent to the Service and the MRNRC for comment. Public meetings were held to gather input prior to finalization.

- d. The Corps should compile a separate annual report by December 31 of each year or include in the Annual Operating Plan a report outlining tern and plover management actions. These reports should contain reasonable and prudent alternatives and reasonable and prudent measures implemented during the operating year, their success in attaining fiedge ratio standards and meeting habitat needs, and anticipated actions for the upcoming year. Monitoring information in the report should include:
 - tern and plover fledge ratios
 - tern and ployer population survey results
 - nest elevations
 - mapping of nesting habitat
 - estimates of sandbar acreage at least every three years
 - historic hourly release data from May 1 to August 30

The Missouri River Interior Least Tern and Piping Plover Permit Activity Report (Report), dated December, 1993, was prepared by the District in order to document survey and monitoring activities during 1993. Information on additional studies is also contained in the report. Summary tables and charts from this Report are included in Appendix E. Additionally, tern and plover management actions were provided to the Region for inclusion in the 1993-94 AOP.

e. The Corps should map periodically (at least every three years), all essential tern and plover nesting habitat used by terns and plovers on the Missouri River.

Each field office manually maps nesting habitat each year for inclusion in the Appendix to the annual Report (U.S. Army Corps of Engineers, 1993).

f. The Corps should continue its Investigation of Channel Degradation studies to research the long-term effects of riverbed changes and its impact to tern and plover nesting habitat, forage availability, and forage areas. The results of these studies should be reported each year in the annual report and considered and included as appropriate.

Channel degradation studies are done approximately every ten years, as funding allows, below the main stem dams. Known within the Corps as the Sedimentation Program, the purpose of this program is to systematically assess the operating conditions of the Omaha District reservoirs as they relate to sedimentation issues. The program includes periodic surveying, bed material sampling, analysis to establish trends, and prediction of future conditions (U.S. Army Corps of Engineers, 1993c). The type of information gathered at the permanently-established cross-sections over time can provide insight into the water depths available at a certain

discharge; variation in island height, shape, and location; and some information on bank erosion as related to the permanent monuments. This information is supplemented by other Corps efforts.

2. Reasonable and Prudent Measures - Omaha District Responsibilities

The Service considers Reasonable and Prudent Measures as conditions or actions necessary and appropriate to minimize take. Section 9 of the Endangered Species Act (Act) makes it unlawful for any person to take an endangered species. As defined by the Act, the term Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct [16 USC 1532(19)]. Further, harm is defined to include: An act...[that] may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering (50 CFR 17.3). However, Section 7(b)(4) of the Act permits taking of some individuals of an endangered species, if the taking is incidental to the Federal action under consultation. Such incidental taking is not to the degree that the continued existence of the species is likely to be jeopardized [50 CFR 402.14(i)].

a. All tern and plover nesting habitat on riverine reaches below dams, including the headwaters of Lewis and Clark Lake, as well as reservoir areas during long-term drought, should be monitored (fledge ratios determined) and surveyed (total edult bird count) on a yearly basis during the May through August nesting seasons. These actions will insure operations of dams may continue in a manner to avoid the unnecessary taking of birds. Long-term drought periods are defined as 2 or more years of equal to or less than 45 million acre-feet of year-end storage with less than median inflows.

The December 1993 Report (U.S. Army Corps of Engineers, 1993) summarizes tern and plover survey and monitoring efforts during 1993. Relevant tables and charts, especially those regarding nest success information from the Report, are included in Appendix D.

During 1993, most of the birds on the Missouri River were found below Fort Peck, between Gavins Point Dam and Ponca, Nebraska, and just above the mouth of the Niobrara River. Productivity monitoring is measured in fledglings per pair or the number of young birds produced per breeding pair. This ratio is an estimate, since exact fledging rates are impossible to obtain. Details on tern and plover monitoring during 1993 can be found in the annual Report (U.S. Army Corps of Engineers, 1993), and a summary of actions can be found in Appendix B. See also Conservation Recommendation 1 later in this report for information on 1993 monitoring on reservoirs.

Extended periods of rain, cold damp weather, and high winds delayed completion of the adult population census throughout the Missouri River until 24 July. Reaches

conducting the adult census and dates during which the census was conducted are listed below.

Lake Oahe, SD (southern 1/3)	22 - 30 June
Gavins Point River	29 June – 07 July
Fort Peck River	14 - 16 July
Lake Sakakawea	10 - 24 July
Garrison River	07 - 16 July
Lake Oahe, ND	12 - 20 July
Lake Oahe, SD (central 1/3)	06 July
Fort Peck Reservoir	10 - 11 June
Lake Oahe, SD (northern 1/3)	13 July
Fort Randall River	22 July
Lewis and Clark Lake	09 - 13 July

Figure 11: Least Tern and Piping Plover Survey Data

MISSOURI RIVER MAIN STEM

	1986	1987	1988	1989	1990	1991	1982	1993	1986	1957	1958	1869	1990	1991	1892	1993
Ft Peck Lake Adults	_	4						-								
Fledgling/Pair	-	4	3	4	6	10 0,50	0	7 9.00	16	10	10	1 <u>2</u> 1.50	22	25	28	30
					-	U.20	v	2 .04			_	1,60	-	1.00	1.30	D.60
Ft. Peck to Lake																
Sakakawes Aduks	_		18	51	44						_					
Fledgling/Pair	-	_	1.88#	1.62#	92 0,20#	56 0.70#	110 0.82#	30 0.484		_	5	11	17	13	D	2
· I T P C I I I I I I I I I I I I I I I I I I				1.040	D-12-011	9.10	0.02#	4.480	_	_	~	-	_	v	O	
Lake																
Sakakawea																
Adults	-	-	7	15	6*	8	29	14	_	-	143	57	132	150	108	5
Fledgäng/Pair	-	-	-	-	-	0	0.05#	0.22#	-	-	-	-		_	1.50	22.74
Garrison Dam																
to Lake Oalte																
Adults	171	175	142	122	174	195	198	138	138	160	113	86	71	121	77	125
Fledgiling/Pak	-	-	0.636	0,42#	0.44#		0.48	0.296	-		1.0#	0.26#	1.054	1.06#		
														-14411		
Lake Oahe																
Adulta Eledelle - Meh	16"	21"	52	97	100	143	124	147#	4*	4*	55	140	68	67	143	77
Findgilmg/Pajr	0.75	1.52	-	-	-	-	0.48	0.00	-	2,5"	0.90	-	-	-	0.96#	0.24#
Pt. Randall to Lewis & Clark Lake																
Adulta	25	60	45	4	67	82	20	36	11	16	31	Ó	31	45	12	12
Fiedgling/Pair	0.48	0.43	D.14	o	D.34#	0.23	0.30	0	0.18	D.13	0.07	0.00	0.69	0.21	0.60	0.00
Lewie and																
Clark Lake Adults				•												
Fledgüng/Pair	_	-	_	29 0.64	21 0.34#	25 0	22 2.09	76 0.97	-	-	•	18	11	12	1	32
· magangri an			-	0.04	·	•	2.110	0.21	7	-	-	0.56	0.69*	0	0	90.0
Gavina Point																
Dam to Ponca																
Adults	181	232	252	210	160	163	186	272	470	477						
Fledgling/Pair	0.16	0.67	0.49	D.55	0.488	0.26	0.22	0.63	172 0.05	177 1.13	212	122	144	185	111	109
	******	4.41	1022	2142		Y-4-9	Yes	9,93	4.43	1.13	0.62	0.21	0.41E	<u>D.35</u>	0.35	1.05
Adult Totals	393	492	549	532	632	702	889	720	342	367	568	446	516	U 18	478	392
Fiedgling/Pair	0.25	0.46	0.64	0.70	0.40	0.44	0.47	0.49	0.08	1.08	0.82	0.95	0.62	0.64	0.96	0.91
(Weighlad Average)																

Data not collected

Partial survey results

^{} No birds found

[#] Sub-sampling of selected nesting area

c. The Corps should continue monitoring daily and hourly fluctuations in releases below all dams or any changes in release due to maintenance or other reasons and use this information in combination with measure (a) above to avoid and minimize take and document unavoidable taking.

Stream gages have been installed on the Missouri River to monitor stream flows during the nesting season and to provide a stage history throughout the season. Information from the gages helps the corps relate the effects of regulation and natural events at intervals along the river. A dynamic flow routing model has been developed to closely predict maximum river stages along the river for different combinations of daily discharge and hourly power peaking characteristics.

Nests were moved to higher elevations in the Missouri River below Fort Peck Dam due to rising stages in the Yellowstone River and the Missouri River below the Yellowstone.

The Region accomplishes special flow controls for the terns and plovers annually. These special flows are discussed annually in the AOP.

d. The Corps should implement public information and education programs to increase public awareness and reduce disturbance to nesting birds

Videotaped footage of island habitat and chicks was scripted and made into a 20-second televised public service announcement (PSA). This PSA was distributed to television stations in North Dakota, South Dakota, Iowa (Sioux City), and Nebraska (Norfolk) in June 1993. Scripted public service radio announcements were again used this summer in North Dakota, South Dakota, Iowa, and Nebraska cities along the Missouri River. Announcements were targeted for use around Memorial Day weekend, and the July 4th weekend. In addition, a group of Girl Scouts read a public service message that was taped for use on Omaha, Nebraska radio stations, focusing public awareness on nesting birds and chicks along the Platte River as well as the Missouri River. The state of Montana has asked to be exempted from Corps public service announcement efforts, as they feel drawing attention to the small number of nesting birds in this manner may be counterproductive in their state.

Videotaped copies of the surveying and monitoring workshop held by the Field Coordinator were sent to all assisting agencies and take offices. The videotapes can be used to orient new surveyors, as well as a review for all field data collectors.

Figure 12: Public Awareness Activities by Office

Office	Campfire Talks	PSA's/ Media	Other
Peck	х	•	
Garrison			
Oahe		×	
Randall		-	Х
Gavins	х	Х	х
Omaha		х	×

3. Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Although such conservation recommendations are not required, they are recommended to help the recovery of the species. Conservation recommendations were not assigned to the Omaha District by the Region, but are implemented as time and funding allow.

a. Reservoir populations of least terms and plping plovers should be monitored and surveyed each year rather than just during drought periods (see Reasonable and Prudent Alternative 1). This information will help evaluate the System as a whole. Sub-sampling techniques to obtain statistically valid monitoring surveys are acceptable.

Surveying was done on all lakes. Surveys on Lake Peck were suspended by July due to inundation of all tern and plover habitat on the lake. Surveys on the other reservoirs focused on exposed habitat, since much of what was historically available was under water. Survey and monitoring results can be found in Appendix B.

b. Any maintenance dredging operations or dredging permits on the Missouri River should be evaluated by the Corps, in consultation with the Service, for creating tern and plover habitat. Where habitat creation is possible, the Corps will implement actions necessary to create habitat from dredged material.

Section 10 permitting is required for "the construction of any structure in or over any navigable water of the United States" or for "any other work affecting the course, location, condition, or capacity of such waters, and was extended to artificial islands..." (Federal Register, 1986). Installation of the floating islands in

Montana and in South Dakota normally would require a Section 10 permit. However, the Corps of Engineers is exempt from Section 10 permitting [33 CFR 322.c (3)]. Instead, the Corps drafted a memorandum for the islands installed in Montana and another for the islands installed in South Dakota. Each memorandum contained the purpose of the islands, information on the construction of the islands, and the exact location of the islands. The memoranda was submitted to the Regulatory Branch, Omaha District, who then passed on the memoranda to the Regulatory offices in Montana and in South Dakota to be filed.

V. SUMMARY AND CONCLUSIONS

The District has implemented all assigned tasks from the Opinion during 1993, even though high water limited the amount of nesting habitat available for the terns and plovers. Figure 13 summarizes the requirements of the Opinion and 1993 Corps actions that demonstrate that these requirements were met.

Figure 13: District Execution of Required Tasks

Opinion Tasks	Met?	Corps Actions
Alt. 1b - habitat creation	yes	Installation of six Bestmann "Schwimmenkampen" islands
Alt. 1c - high flow habitet	γes	below Fort Peck; Lake Audubon
Alt. 2 - mgt, goals in AOP	yes.	plans in 1992-93 AQP
Alt. 3 - annual report	yes	in 1992-93 AOP and 1993 Annual Report
Alt. 5 - map nesting habitat	yes	maps begun (mapping is a multi-year effort)
Att. 6 - channel degradation study	À6a	continuing existing studies
Meas. 1 - survey and monitor	γ s s	nver reaches monitored and surveyed as long as habitat was above water
Meas. 2 - monitor flow fluctuations	yes	gage information factors into flow decisions from RCC
Meas, 4 - public awareness	yes	press releases, public and agency telks,

The District implemented Conservation Recommendations during 1993, as indicated in Figure 14. Conservation Recommendations are not requirements, but Federal agencies should, in good faith, do what can be done to speed the recovery of listed species.

Figure 14: Execution of Conservation Recommendations

Conservation Tasks	Met?	Corps Actions
1 - survey and monitor reservoirs	λea	all reservoirs monitored and surveyed
2 - review dredge permits	N/A	dredging actions during 1993
3 - actions to increase productivity	γes	Nest relocation and predator aversion

The implementation plan for the Biological Opinion (the Red Book) and the Opinion were both developed while the Missouri River system was recovering from a severe drought situation. Since then, the Missouri River system has gone undergone severe flooding conditions due to record inflows, entering into a period of high water and flooding. High water limited habitat development called for unanticipated tasks not described in the Red Book or the Opinion. A new implementation plan is being developed, which will take into account varying hydrological conditions.

V. REFERENCES

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VI. APPENDICIES

A. Biological Opinion

Reasonable and Prudent Alternatives

Reasonable and prudent alternatives are defined as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal Agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the existence of listed species or result in the destruction of adverse modification of critical habitat.

As mentioned previously, the Missouri River is a dynamic system. Extremes can very from years of very high inflow and storage to years of low inflow and low storage. In the years since the least tern and piping plover has been listed (1986-1989), water flows have fluctuated greatly, from a high-water year in 1986 to extreme drought in 1989. The dynamics of the Missouri River system are such that management plans (Operating Plans) must be evaluated every year to adjust to system conditions.

The dynamics of the Missouri River and associated sandbar habitat appear to influence then and plover population sizes. Analysis of piping plover and least tern population fluctuations in North Dakota indicate that these birds are limited by the amount of total available sandbar acreage. Fewer least terns and piping plovers nest on the Missouri River below Garrison Dam during years of high maximum June discharge and subsequently reduced sandbar acreage. Thesis trends indicate that nesting terns and plovers are limited by habitat availability.

Colony site turnover rates refer to the annual rate at which birds abandon former nesting sites and pioneer new sites for nesting. Colony turnover rates provide and index of colony stability. High turnover rates indicate low-site stability and may be a function of predation rates, human disturbance, changes in habitat characteristics (i.e., vegetation encroachment, flooding, erosion, etc.) and/or other unknown variables (Cuthbert 1988). Colony turnover rates among nesting least terms and piping plover on the Missouri River in both North and South Dakota are Large (Schwalbach et al. 1988; Mayer and Dryer 1989) when compared to colony turnover rates of coastal or wetlands populations (Burger 1984; Kotliar and Burger 1986; and Wiens and Cuthbert 1988). Habitat changes caused by System operations contribute to Missouri River colony site instability.

In order for System operations to avoid jeopardy to the interior population of the least tern and the Plains population of the piping plover, management steps must be taken to address the quantity and quality of habitat. Fledge ratios (i.e., the number of juveniles produced annually per nesting pair) are an estimate of

productivity. The best scientific information available suggests that fledge ratios of 0.70 and 1.44 for terns and plovers, respectively, will maintain a stable population on the Missouri River. The Service believes that, if these fledge ratios are met each year, the Corps will avoid the present jeopardy situation. Fledge ratio estimates shall be based on statistically defensible samples of nesting birds and be representative of productivity for the entire Missouri River, and the different river reaches (Mayer and Dryer 1988). The Corps must take the necessary management steps to address quantity and quality of habitat so that fledge ratios are met or exceeded in order to maintain a stable Missouri River population.

The habitat area available to nesting birds may best be described as the scour area, which is the area between the mean high and mean low river levels. Although habitat of Missouri River terns and plovers has not been fully evaluated, indications are that most birds nest within the scour area.

Nesting habitat characteristics found to be important on the Missouri River, as well as on other river systems. Include elevation of nest above river level, substrate, percent vegetative cover, average vegetation height, and distance to forage areas (Dryer 1985; Schwalbach 1988). Providing a predator-free and human disturbance-free colony site is also important to productivity of nesting birds.

Optimum habitat may best be described as a complex of side channels and sandbars with the proper mix of habitat characteristics required by the birds. Such sandbar complexes provide regularly scoured habitat for nesting and shallow pools for foraging. Additionally, mammals sometimes reside on large sandbars and in turn may prey upon tern or plover nests and chicks. Hence, it is important to produce many sandbar complexes rather than a few large, isolated sandbars. Also, by creating many sandbars distributed evenly throughout the Missouri River System, impacts on the total population would be reduced because devastation of a single colony would represent a much smaller relative loss to the total population. Methods to increase the nesting habitat area available and to enhance habitat characteristics will be necessary to maximize production in order to meet necessary fledge ratios.

Therefore, to preclude jeopardy, it is the Service's scientific judgment that the significant impacts of System operations on terms and plovers need to be eliminated by implementing all of the following alternative delineated below. These

alternatives act together as a functional unit and must be fully implemented as soon as possible to ensure the continued existence of the interior population of the least tern and the piping ployer.

- The Corps should continue to select and schedule flows from main stem
 dams prior to the least tern and piping plover nesting season (May through
 August), and other times of the year, as appropriate, in order to meet the
 needs of the species.
 - a. Operational-caused flooding of nests or habitat should be avoided during the nesting season. Therefore, flows during the nesting season will beset by nest initiation. Once nests have been initiated, flows should not be increased to imperil nests.
 - b. Natural nesting habitat should be provided as a priority and other management actions implemented to meet or exceed fledge ratio goals (i.e., 0.70 for terms and 1.44 for plovers).

For example, based on the best year of record (1987) for fledge ratios (0.67 for terns and 1.13 for plovers) below Gavins Point Dam, there were 31 nesting sites with a mean size of 8.13 acres. If additional management actions were taken to enhance habitat criteria (as defined below), fledge ratio goals of 0.70 for terns and 1.44 for plovers could be met.) This example only illustrates possibilities on the Gavins Point reach. Fledge ratio goals are to be met for the entire Missouri River populations.)

While the Service can illustrate the best year for the Gavins Point reach because we have the information on hand, we do not have the habitat information needed so that projections for the best

years in other reaches can be made. However, the Corps has the capability, available photography, flow data, and cross-sectional information necessary to determine available habitat. Therefore, the Corps should, based in part on past years information, determine the habitat necessary for each river reach and provide management actions within the Corps authorities to meet or exceed fledge ratios. Under Section 7(a)(l) of the Endangered Species Act, the Corps shall utilize their authorities by carrying out program for the conservation of endangered and threatened species. The corps should use the following parameters when determining habitat and management actions needed to meet or exceed fledge

rations. The following describe some ideal conditions and the Corps should strive to meet these conditions in order to meet fledge ratio goals.

Proximity to Forage Habitat - Tern nesting areas should not be greater than 400 meters from an area that provides schooling and feeding fish that are 3 inches in size. Plover nesting areas must include forage areas (i.e., sandbar flats) as a part of the sandbar nesting complex.

- Substrate Nesting/breeding habitat should consist of very fine to fine sand that is the preferred nesting substrate for terns and plovers. Plovers tolerate some gravel since they use it as nestlining material.
- Vegetation (i.e., at nest initiation) Percent cover for nesting should be no greater than 25 percent. Optimum percent cover is 10 percent or less. Vegetation height should be less than 10 centimeters.
- 3. Elevation of Nest Above River Level Nesting areas should by 8 inches or greater above river levels. This will protect nests by allowing for the 2-inch nest depth, and 4-inch rise caused by wind and weather, or other actions that may course the river to rise in addition to operations. Data collected on the Missouri River shows that, given the opportunity, the majority of birds will nest at 8 inches or greater. However, birds will nest at elevations less than 8 inches, particularly on newly formed (i.e., low elevation) islands. For nests initiated at less than 8 inches (i.e., on sandbars/islands where the 8-inch rule cannot be met), the 8-inch rule will not apply. However, flows should not be increased in order to protect these nests.
- 4. Disturbance-Free Area Nesting areas should be substantially free from both predation and human disturbance. The Corps should take necessary actions to reduce or eliminate predation and human disturbance during nesting.
- c. Due to short-term and long-term adjustments, the Corps cannot make changes in operations to compensate for terms and plovers in all years (i.e., years of high storage and high inflows). When flows below main stem dams may inundate much

nesting habitat, other means will be necessary to establish nesting habitat to meet fledge ratio goals. Created habitat should be established to accommodate the following release flows by river reach and to supplement natural habitat required by alternative 1(b) above.

Fort Peck -- above 8.500 cfs and below 13,200 cfs Garrison -- above 18,000 cfs and below 31,000 cfs Fort Randall -- above 28,000 cfs and below 38,500 cfs Gavins Point -- above 30,000 cfs and below 39,500 cfs

The created habitat should follow the habitat parameters listed above in 1(b)(1) through 1(b)(5). Acceptable management techniques for habitat creation include (1) replenishment or nourishment of sandbars and islands with a dredging operation to create areas above anticipated high river levels; (2) creation of suitable high elevation anticipated high river levels (i.e., above river levels) by mechanical (i.e., dredging or clearing) or structural means, such as chevron wing dikes and jetties; (3) creation or enhancement of shallow and backwater areas, off - channel chutes, and flats as foraging habitat; (4) scouring of island and sandbar habitats with high flows prior to nesting season; and (5) use of Schwimmenkampen type (Hoeger 1988) for artificial islands.

- Prior to implementing tern and plover management strategies for each operating year, the Corps should demonstrate to the Service's Field Supervisor, North Dakota-South Dakota Field Office, that the planned System operations and tern and plover management strategies will satisfy reasonable and prudent alternatives, reasonable and prudent measures, and strive to meet fledge ratio goals. The Corps should provide this information to, and/or meet with, the Service during development of the draft Annual Operating Plan in the fall and after March 1 when the runoff forecast is made. We anticipate that this will provide enough time to plan or implement operational scenarios that will be necessary for the new operating season.
- 3. The Corps should compile a separate annual report by December 31 of each year or include in the Annual Operating Plan a report outlining tern and plover management actions, including reasonable and prudent alternatives and reasonable and prudent measures implemented during the operating year, their success in attaining fledge ratio standards and meeting habitat needs, and anticipated actions for the upcoming year. The purpose of this report is to provide the Service and the Missouri River Tern and Plover Management

Team the information necessary to evaluate the effectiveness of the Corps

Actions. Monitoring information in the report should include:

- a. Tern and plover fledge ratios;
- Tern and plover population survey results;
- c. Nest elevations;
- d. Mapping of nesting habitat, including changes in sandbar morphology
- e. Estimates of sandbar acreage as modeled by the Corps cross-sectional data (provided at least every 3 years with updates on the data collection included in the Annual Report);-and
- f. Historic hourly release data from all dams, including water levels for all reaches for the May 1 to August 30 season.

Further details on items a, through f, above are found later in this report under Terms and Conditions for implementation of Reasonable and Prudent Measures.

- 4. The Corps should form a Missouri River Tern and Plover Management Team (Team). The Team will consist of Federal and State wildlife agencies. These agencies will be contacted to verify their willingness to participate. The annual report (see Reasonable and Prudent Alternative 3) will be provided to this Team (by December 31 of each year). The Team will review the annual report and provide management views to the Corps for the following operations season. The Team will meet shortly after March 1 of each year to provide views to the Corps. The Corps will be responsible for scheduling and arranging the Team meetings. Since agency-funding involvement will be voluntary, the Corps will not be responsible for funding other agency participation.
- 5. The Corps should map, on a periodic basis (at least every 3 years), all essential tern and plover nesting habitat, used by terns and plovers, on the Missouri River as identified in appendix 1 and the recovery plans. This information can, in part, be obtained from cross-sectional information the Corps uses in its hydrology studies and bird-monitoring studies since 1986. The mapping information, in conjunction with the Corps Satellite Data Collection and Synthetic Modeling (as described in Corps 1989a and 1989b), can be used to determine tern and plover habitat available under different operating scenarios and can be used to assist in establishing and implementing management actions that need to be carried out to meet fledge ratio goals. Mapping products or updates on data collection will be provided in the annual report (see Reasonable and Prudent Alternative 3).

6. The Corps should continue its Investigations of Channel Degradation studies

to research the long-term effects of riverbed changes and its impact to tern and plover nesting habitat, forage availability, and forage areas. The results of these studies should be reported each year in the annual report and considered and included as appropriate.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Toe following will further the conservation of least terms and piping plovers on the Missouri River.

- Reservoir populations of least terms and piping plovers should be monitored and surveyed each year rather than just during drought periods (see terms and conditions to implement Reasonable and Prudent Measure 1). This information will help evaluate the System as a whole. Sub-sampling techniques to obtain statistically valid monitoring surveys are acceptable.
- 2. Any maintenance dredging operations or dredging permits on the Missouri River (Section 10/404 of the Clean Water Act) should be evaluated by the Corps, in consultation with the Service, for creating tern and plover habitat. Where habitat creation is possible, the Corps will implementation actions necessary to create habitat form dredged material.
- 3. The Corps should strive to meet Missouri River recovery goals for terns and plovers (800 tern adults for 10 years (USFWS 1989a) and 485 plover pairs (970 adults) for 15 years (USFWSb 1988b)) by implementing additional tern and plover management actions, beyond the scope of the reasonable and prudent alternatives, that would further increase productivity (i.e., as indicated by increases of fledge ratio goals).

The Service requests notification of the implementation of any conservation recommendations by the Corps. This courtesy will keep us informed of conservation and recovery actions. Additionally, this will assist the Service and the Corps in making a determination concerning the need for Endangered Species Act Section 10 permits. Section 10 permits are necessary for scientific purposes and enhancement of propagation or survival of listed species (i.e., monitoring and management actions for terms and plovers).

INCIDENTAL TAKE

Section 9 of the Act make it unlawful for any person to Take an endangered species. As defined by the Act, the term Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap capture, or attempt to engage in any such conduct (16 U.S.C. 1532(19)). Further, harm is defined to include An act...[that] may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering (50 CFR 17.). However, Section 7(b)(4) of the Act permits taking of some individuals of an endangered species, if the taking is not to the degree that the continued existence of the species is likely to be jeopardized (50 CFR 402.14(I)).

The Service has determined that System operations will result in an incidental take or zero for bald eagles. The incidental take for terns and plovers is the amount of extent of anticipated take after the reasonable and prudent alternatives are implemented. For reasons discussed below, incidental take of least terns and piping plovers likely will occur as a result of direct or indirect effects.

Piping plovers and least terns may begin incubation as early as mid-May, but the incubation period begins principally from early to mid-June. Nest initiation by the birds lasts 1 to 2 weeks and is followed by a 25- to 29-day incubation period. Fledging occurs approximately 21 to 26 days after hatching. Re-nesting may occur such that the birds may not fledge until late August. Thus, the nesting season extends from nest initiation around May 1 until fledging around August 31. Although to Corps has included tern and plover management considerations in the operating plan during the nesting season since 1986, nests and chicks have still been lost (Schwalbach 1988; Mayer and Dryer 1988; Dirks and Higgins 1988; USFWS1989b). Therefore, it is anticipated that even after implementation of reasonable and prudent alternatives, a loss of birds during the nesting season may occur.

While the reasonable and prudent alternatives are designed to avoid jeopardy to the species, losses may be expected because of unanticipated effects of operational changes, human error, or acts of God, such as wind and flood. The following types of unavoidable losses are possible:

- Taking of eggs and flightless young by flooding or erosion. This has been documented below Gavins Point, Fort Randell, and Garrison Dams;
- 2. Precluding nesting and re-nesting of terms and plovers by inundation of or

wetting of sandbar, islands, or shoreline nest habitat. This has been documented below all dams and on reservoirs;

- Increasing predation on nests, chicks, and adults as a result of reduced nesting habitat or changes in predator/prey relationships;
- Increasing susceptibility of eggs and young to disturbance and/or destruction by human activities as result of reduced nesting habitat; and
- Continued loss of habitat due to degradation and vegetative encroachment.

Having made the determination that incidental take is likely to occur, the Service must provide a statement that specifies the following:

- The impact (i.e., amount or extent) of anticipated take that will not violate Section 7(a)(2);
- 2. The reasonable and prudent measures necessary to minimize the amount or extent of incidental take;
- The terms and conditions, including reporting requirements that must be complied with by the Corps in order to implement the reasonable and prudent measures; and
- 4. The procedures to be used to handle or dispose of any individual least tern or piping plover actually taken.

Amount or Extent of Incidental Take

The Service anticipates that, even if reasonable and prudent alternatives are successfully implemented, a minimal amount of incidental take of least terms and piping plovers will occur directly or indirectly as a result of System operations. This take may be in the form of killing, harming, and harassing which includes loss of habitat, loss of individuals, and loss to recruitment.

The amount of anticipated take likely to occur is unpredictable because it is difficult, if not impossible, to determine if take will always be the result of System operations, other outside System influences, or a combination of actions.

Therefore, determination of a specific amount of take is not possible.

We believe the implementation of the reasonable and prudent alternatives will avoid the likelihood of jeopardizing the continued existence of the interior population of the least tern and the Plains population of the piping plover. Additionally, the implementation of the reasonable and prudent measures will minimize the amount or extent of incidental take. In other words, any incidental take that may occur should be offset by the implementation of the reasonable and prudent alternatives and reasonable and prudent measures. Therefore, the Service has determined that the extent of take resulting for the Corps action or inaction that is not likely to jeopardize the species is that take which will not cause the fledge rations to drop below 0.70 (terns) and 1.44 (plovers) during a given nesting season. In making the determination, if the results stem from the Corps action or inaction, the Service will confer with the Management Team. While fledge ratios are based on the best scientific information available, new information may be presented in future years which may necessitate a reconsideration of fledge ratio goals as set above. If new information does become available that reveals effects of the action that may affect the species in a manner or to an extent not previously considered, Section 7 consultation must be reinitiated.

Authorization for incidental take under Section 7 of the Endangered Species Act is not an authorization for take under the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act.

Reasonable and Prudent Measures

The Service considers the following reasonable and prudent measures with their implementing terms and conditions to be actions necessary and appropriate to minimize take.

1. All tern and plover nesting habitat on riverine reaches below dams, including the headwaters of Lewis and Clark Lake, as well as reservoir areas during long-term droughts, should be monitored (fledge ratios determined) and surveyed (total adult bird count) on a yearly basis during the May through August nesting season so that operations of dams may continue in a manner to avoid the unnecessary taking of birds. Long-term drought periods are defined as 2 or more years of equal to or less than 45 million acre-feet to year-end storage with less than median inflows

- 2. The Corps should continue monitoring daily and hourly fluctuations in releases below all dams or any changes in release due to maintenance or other reasons and use this information in combination with measure 1 above to avoid and minimize take and document unavoidable taking.
- 3. The Corps should continue to evaluate operational changes that may be used to avoid take.
- The Corps should implement public information and education programs to increase public awareness and reduce disturbance to nesting birds.

Terms and Conditions for Implementation of Reasonable and Prudent Measures

In order to be exempt from the prohibitions of Section 9 of the Act, the Corps, must comply with the following terms and conditions that implement the means to carry out all reasonable and prudent measures.

Reasonable and Prudent Measure 1 - Productivity and population surveys on reaches below dams shall be conducted each year. Reservoirs shall be surveyed during drought years (less than 45 million acre-feet of year-end storage with less than median inflows) to monitor birds that pioneer exposed reservoir shoreline areas and thus provide accurate estimates of system-wide productivity and population sizes. For example, during the severe drought of 1988 and 1989, 13 percent of least terms and 39 percent of piping plovers nesting within the Missouri River System were found above system dams. Had these birds not been accounted for, population sizes and productivity rates would have been grossly inaccurate.

Population survey information will include (1) the total number of colonies (2) the total number of birds, and (3) mapping of habitat used by birds (i.e., general location map of colony sites and acreage determination).

Productivity (i.e., nest and fledge success) estimates will be based on sub-samples of the nesting population in each river reach. Consideration in determining sub-samples will be given to total number of birds, total number of colony sites, and habitat characteristics. Monitoring information from sub-samples will include (1) the total number of nests, (2) that total number of fledged birds per nesting pair and causes of nest and chick loss and (3) elevation of nests above water levels and distance to water's edge. Calculations for the fledge ratio standard will be a weighted average for the entire river based on

the number of pairs.

Survey and monitoring information, in conjunction with the Corps Satellite Data Collection (as described in Corps 1989a and 1989b), can be used to develop management plans that will avoid taking of birds during the nesting season as well as determine if fledge rations are met as described in the reasonable and prudent alternatives and requirements for re-initiation of consultation. With such a monitoring program in place, the Corps will know when and how operations may result in take as well as be able to avoid take.

Annual Report - In regard to Reasonable and Prudent Measures 1 through 3, in addition to those items identified in Reasonable and Prudent Alternative 3, the Corps will include the following in the annual report:

- Any taking, including loss of eggs, chicks, adults, and habitat, that occurred, including reasons for take and actions to avoid take; and
- Evaluations of operational efforts to avoid take (habitat and birds).
 The above information may be placed in the Corps Annual Operating Plan.

Reasonable and Prudent Measure 2 - All incidences of take must be documented and immediately reported to the Service (see above annual reporting requirements).

Reasonable and Prudent Measure 3 - If the Corps develops new operational scenarios that were not considered during this consultation, then consultation for these new actions will need to be reinitiated (see above annual reporting requirements).

Reasonable and Prudent Measure 4 - the following action will be taken to implement this reasonable and prudent measure.

Production of a Public Service Announcement (radio release and television video) informing the public of terns and plovers on the river. The Public Service Announcement shall be distributed to radio and television stations within the States bordering the Missouri River to be used at least from May through August. The video shall be available for public use and used in the Corps project office interpretive programs.

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- 2. Corps project offices will engage in intensive public relations efforts for tern and plover conservation to take place on Corps land including but not limited to displays, video productions, naturalist talks, information flyers or brochures, information placed in campground notices, and informational, posting of boat ramps.
- 3. Provide personnel and assistance to work jointly with the States and the Service on adequate posting and roping of all nesting area on the Missouri River. State and Service personnel will each year coordinate efforts with the Corps and determine each agency's level of participation.

Procedures for Handling or Disposing of Least Terns and Piping Plovers

All eggs, chick or adults of least terns and/or piping plovers found dead on the Missouri River will be immediately (within 24 hours) reported to the North Dakota-South Dakota Field Office or a law enforcement agent of the Service for instructions on proper disposal.

B. FY 93 PLANS AND ACCOMPLISHMENTS

SUMMARY OF THREATENED AND ENDANGERED SPECIES ACTIVITIES IN THE OMAHA DISTRICT FOR 1993

a. Fort Peck

Three sets of paired "Schwimmenkampen" floating modular units were installed at River Miles (RMs) 1699.2, 1691.2, and 1689.5 in April 1993. Island units were placed on existing low elevation islands, and sand was "mounded" around them, simulating natural contours. Tern decoys were placed on the floating islands at 1699.2 and 1689.5. It was hoped that these islands would provide a floating surface to combat flooding caused by tributary inflow in this section of the river.

Burning was not necessary early in the season, due to vast amounts of exposed shoreline due to low water levels. Later in the season, however, water elevations rose due to heavy rainfall.

b. Lake Sakakawea

Vegetation was burned on the Deepwater Bay Entrance Island during April 1993. Willows (5 - 15 feet tail) were also cut down, and oyster shell was experimentally placed on two locations. Deepwater Island (RM 1444) in the Van Hook Arm was burned on April 29 by Corps personnel and personnel from the Three Affiliated Tribes. About 40% of the Island vegetation, primarily Kochi, were removed. On May 5, 12, and 18, Corps personnel cut down approximately 500 young cottonwood and willow trees to prevent roosting by avian predators. Most of the trees were between five and ten feet tail.

Vegetation was removed on several river islands using a glyphosate-based aquatic herbicide, sickle mower, cutting (woody saplings), and burning. In addition, snow fence was again used to create dunes and to fill in low areas on islands. These actions took place during the fall of 1992.

On August 25 and 26, chemical spraying using the herbicide Rodeo was done to remove vegetation on islands at RMs 1373.6 (2.6 acres) and 1371.7 (6.4 acres), totaling 9 acres of new area. In addition, maintenance vegetation removal was done on RM 1352.5 (6.4 acres).

On August 17, 23, and 25, sand fences were erected on sandbars at RMs 1374.6, 1373.3, 1366.0, and 1351.3. Sand fence removal and placement of oyster shell was done in November.

Rubber snakes were not utilized due to the high water present during most of the summer, already limiting available nesting area. Maintenance burning of islands was done on an "as needed" basis. Spring spot spraying was not an option during 1993. Predator cages were used to deter predation during 1993.

c. <u>Lake Oahe</u>

This work was not performed due to high water levels in Lake Oahe resulting from rainfall and increased tributary input into the Missouri River upstream from Lake Oahe. The area stated for habitat work is now under water, and may be scoured off due to wave action.

The selected area was under water for the same reasons stated above. Due to the variation in water surface levels, future habitat work will target anticipated water elevations for that summer. Even so, unforeseen conditions could impact these "bonus" reservoir-nesting areas.

During the fall of **1993**, islands at RM 1351 and 1368 had sand fences installed for sand dune creation. Oyster shell was placed on the newly formed dunes to prevent wind erosion. Islands at RM 1371.1 (2.8 acres) and 1373.5 (6.4 acres) had Rodeo treatment to remove vegetation.

d. Missouri River below Ft. Randail Dam

Phase 1 Goal: Maintenance of Existing Habitat, including newly created habitat from FY 92

Vegetation was removed from three river islands using a glyphosate-based aquatic herbicide during the fall of 1992. Sand fences were also installed during the fall, 1992, but were scoured off by river ice.

A cool, wet spring was not conducive to early leaf-out, therefore spring herbicide spraying was not done. Wet conditions also precluded burning at this time.

Island areas in this reach where predator cages have been used will now be discussed in the "Lewis and Clark Lake" section, which encompasses all islands downstream from the Niobrara River (RM 845) through the headwaters of Lewis and Clark Lake.

e. Lewis and Clark Lake

Fourteen floating islands were attached and installed in upper Lewis and Clark Lake between April 26 and 28. Two buoys were also installed at this time. A detailed description of the action, as well as photos, can be found in Section III (3)(b).

Glyphosate-based aquatic herbicide was used to control vegetation on dredge islands during the fall of 1992. During the month of September, 1992, bulldozers were utilized to push up sand from low elevation islands into higher "mesa" areas during a weeklong effort. Four of the islands were then armored with either standard burlap sandbags, or larger

f. Missouri River below Gavins Point Dam

Maintenance of Existing Habitat, plus creation of at least 54 acres (FY 93 - FY 95 total) of new or reclaimed habitat

Cool and wet weather precluded effective use of herbicides and burning for vegetation control. Extensive vegetation control was done during August and September using a 4-wheel ATV and boom attachment.

Island areas downstream from Gavins Point dam were pushed up to higher elevations using buildozers during October, 1992. These activities resulted in two islands totaling almost 2 acres of high nesting habitat. This habitat was utilized by terns and plovers during the summer of 1993, fledging 8 plovers and 3 terns.

Beginning in **1993**, islands at the above-listed river miles were considered habitat maintenance areas where the Corps has already done habitat work, and now will continue to maintain habitat on these islands. Habitat maintenance was described as follows:

- using Rodeo herbicide to control vegetation
- 2. burning of dead vegetation
- armoring of existing islands with sandbags or SEA bags.
- installation and removal of sand fences; placement of oyster shell or gravel
- removal of large driftwood and other non-living potential predator habitat
- minor sand-dune reshaping using hand tools, a small Bobcat, or equivalent
- mowing of vegetation
- hand-cutting of woody saplings (< 4 inches, dbh).

Maintenance activities were scheduled prior to the arrival of the birds, after the birds leave, or on islands not being utilized by birds in a given year. The spring and summer of 1993 contained numerous storm events resulting in upper decibel inflows. Flood control measures from Gavins Point Dam resulted in less water being released, and therefore great expanses of sand for nesting habitat by midsummer.

Habitat creation and maintenance included late October efforts, with assistance

from the 200th and 854th Units of the South Dakota National Guard, inmates from the Yankton Federal Prison Camp, as well as numerous Corps staff. Nine sites at six island locations were created, totaling about 4 acres at RM 804.5-804.6, 803.8, 802.7, 801.5, 801, and 799.2. Sites were pushed up to an average of 46 inches above existing elevations using heavy equipment (D6 and D7 bulldozers, front-end loader). In addition, approximately 18 acres of habitat was mowed, with 7 of these acres available for 1994 nesting. The remaining acres needed spring herbicide treatment prior to the nesting season. SEA bags were placed on the upstream ends of RM 803.8 and 801.5. Residual vegetation remaining after mowing at RM 801 was burned using a flame-thrower.

A total of 38 predator cages were used in this reach during 1993, with a total nesting success of 76%. Unsuccessful nests were flooded in the aftermath of the heavy rains. Three strobe systems were also utilized in this reach. Two remained operational for the entire season, and had a combined fledge ratio of 2.75 plover chicks per pair, and 1.77 tern chicks per pair.

Photo 3: The piping plover is federally listed as "threatened".

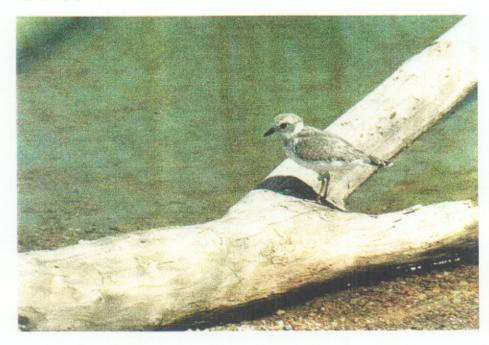


Photo 4: Least tern eggs and chick: habitat work, in combination with predator control and public awareness, result in success, such as with this least tern a nest and chick.



Photo 5: Interior least tern with chick.



Photo 6: Piping Plover chick; monitoring nest success and chick survival assists us in our effort to ensure a future for this piping plover chick and other hatchlings.



C. COORDINATION AND PERMIT ACTIVITY

Planning Division

Mr. M. S. Zschomler Field Supervisor North Dakota-South Dakota Field Office U.S. Fish and Wildlife Service 420 S. Garfield Avenue, Suite 400 Pierre, South Dakota 57501-5408

Dear Mr. Zschomler:

Enclosed is an application for an endangered species permit to authorize the Corps to survey populations and productivity of interior least terms and piping plovers on the Missouri River. Your prompt attention to this matter is greatly appreciated.

Sincerely,

Howard N. Thelen Chief, Planning Division Civil Works and Planning Directorate

Enclosure

Copy Furnished:

Taylor/CEMRD-CW-PR

U.S. Fish & Wildlife Service, Region 6, ATTN: Max Schroeder w/cy enclosure SD Cooperative Wildlife Research Unit, ATTN: Mr. Casey Kruse w/cy enclosure

CEMRO-OP-NE, ATTN: Mr. Rick Moore

w/cy enclosure

Thelen/CEMRD-CW-P



DEPARTMENT OF THE INTERIOR

U.S. FIZH AND WILDLIFE SERVICE FEDERAL FISH AND WILDLIFE	MAPORT OR EXPORT LICENSE
LICENSE/PERMIT APPLICATION	L BRIEF GESCRIPTION OF ACTIVITY FOR WHICH REQUESTED LICENSE OR REPORT IS NEEDED.
The whork	Population and Productivity Surveys of Interior Least Terms and Piping Plovers
B. APPLICANT, IN and, excellent address and phone repair of individual, basiness, agency, or institution for which premis is requested. U.S. Army Corps of Engineers Missouri River Division	Along the Missouri River from Ponca, NE to Williston, ND
P.O. Box 103, Downtown Station Omaha, NE 68101-0103	-
A 15 "APPLICANT" IS AN INDIVIOUAL EMPLETE THE FOLLOWING:	S. IF "APPLICANT" IS A BUSINESS, CORPORATION, PUBLIC AGENCY. OR INSTITUTION, COMPLETE THE FOLLOWING:
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DATE OF BIRTH COLOR BYES	Water Resources Agency
PHONE NUMBER WHERE SHPLOYED SOCIAL SECURITY HUMBER	
GCDJPATION .	
ANY BUSINESS, AGENCY, OR INSTITUTIONAL AFFILIATION HAVING TO DO WITH THE WILDLIFE TO BE COVERED BY THIS LICENSE/PERMIT	NAME, TITLE, AND PHONE NUMBER OF PRESIDENT, PRINCIPAL OFFICER, DIRECTOR, ETC.
·	COL John E. Schaufelberger Commander is "APPLICANT" is A CORPORATION, INDICATE STATE IN WHICH IMCORPORATED 402-221-7200
& LOCATION WHERE PROPOSED ACTIVITY IS TO BE CONDUCTED	7. DO YOU HOLD ANY GURRENTLY VALUE FEDERAL FISH AND MILDUIFE LICENSE OR PERMITT YES THE NO HIS yes, the learner of professoral
Missouri River	
From Ponce NE to Williston, ND	S. IF REQUIRED BY ANY STATE OR FOREIGH DOVERHMENT, DO YOU MAVE THEIR APPROVAL TO COMOUCT THE ACTIVITY YOU PROPOSET YES LAST WIND AND TYPE OF SECURIFIED
9. CERTIFIED CHECK OF MONEY ORDER (IT applicable) PAYABLE TO THE U.S. F.SH AND WILDLIFE SERVICE ENCLOSED IN AMOUNT OF	SO, OESIRED EFFECTIVE SIL DURATION NEEDED
•	15 May 1993 31 December 1993
ATTACHMENTS: THE SPECIFIC INFORMATION REQUIRED FOR THE TY ATTACHED, IT CONSTITUTES AN INTEGRAL PART OF THIS APPLICAT PROVIDED.	PE OF UICENSE/PERMIT REQUESTED IS-USD CFR 13.13(4)(HUST BE IDH, LIST BECTIONS OF 30 CFR WHOER WHICH ATTACHMENTS ARE
50 CFR 17.22	
. CERTIF	ICATION
. OFFIN ATTOMS AND THE REPERD ARRIVELDS IN BARTS IN SINCEMARTER DA	
John & Sola Dilling	APRIL 30 1993

1. APPLICATION FOR (Indicate ant) seel

THE SECTORS

ENDANGERED SPECIES

:- <u>c</u>	OMPLETE THE FOLLOWING:			
я.	Species: Sterna Antillarum (Scientific neme)	Interior Least Tern (Common name)	Number	Age S
ъ.	At the time of application, the // has been removed from the w	cild (country & place of	of removal)	
¢.	Accempts to obtain the vildlife the wild.			
	Permit is requested for su See attachments.	rveys only.		
	be used, displayed or maintaire	ess of the institution or facility. d. Not Applicable		
. <u>k</u>	TIACE THE FOLLOWING INFORMATION O	N PLAIN WHITE PAPER:		
f.	Copies of contracts and agreemen persons who will engage in the a	ts relating to the permit, included tivities and the dates of such a		/ of #11
8.	A statement justifying the permi (1) Details of the activities (t, including: actach research proposals, if sop	propriace).	
		carried out. fic objectives or to enhancing co	ne propagation of	: surviv:
	of the wildlife involved. (4) Planned disposition of the	wildlife upon cermination of the	activities.	
ı. <u>ı</u> :	F LIVE WILDLIFE IS TO BE COVERED	BY THE PERKIT:		
	Accech photographs or diagrams of	the area and facilities where wi	lidlife will be h	ioused
	and cared for. Dive a brish resume of the technic	cal amperise of the persons the	will care for an	· - h

watering, and otherwise caring for it during that period. 5) Provide a decailed description of all mortalities during the preceding 5 years involving the species covered in the application and held by the applicant (or any other wildlife of the same genus or family held by the applicant), including the

4) Describe the type, size and construction of all containers wildlife will be placed in during transportation or temporary storage, if any, and the arrangements for feeding,

causes of such mortalities and the steps taken to avoid or detrease such mortalities.

wildlife including any experience the applicant or his personnel have had in raising,

caring for, and propagating similar wildlife or any closely related wildlife. 3) Indicate your willingness to participate in a cooperative breeding program or to

contribute data to a studbook.

THREATENED SPECIES

I_	COMPLETE	TEZ	POLLOWING:

4.	Epecies:	Charadrius Melodus	Piping Plover	Number_ Les : y
	_	(bcientific mana)	(Comps Band)	
۶.	At the t	ime of application, the will been removed from the wild		
	/7 was	reland in captivity	(country & place	of removal)
	_		(country and place where	e wildlife was born)
٤,	Attempts the wild.	to obtain the wildlife in .	a manner which would not cause	se the death or removal f.v
		is requested for surveys achments.	only.	•
۵.	A comple be masd,	te description and address displayed or maintained.	of the institution or facili	ty where the wildlife wi
		<u> </u>		
,	-		:	
II. A	TIACE THE	FOLLOWING INTORNATION ON PL	ATH WESTER PAPER.	
	Copies of	contracts and agreements r	elacing to the permit, incluities and the dates of such	ding the identity of all activities.
z.	(1) Decar	nt justifying the permit, it is of the activities (atta	ch research proposals, if an	propriece).

- (2) how the activities will be carried out.
- (3) The relationship to scientific objectives or to enhancing the propagation or survival of the wildlife involved.
- (4) Planned disposition of the wildlife upon termination of the activities.

III. IF LIVE WILDLIFE IS TO BE COVERED BY THE PERHIT:

- 1) Artach photographs or diagrams of the area and facilities where wildlife will be homeed and cared for.
- 2) Give a brief resume of the technical expertise of the persons who will care for each wildlife including any experience the applicant or his personnel have had in raising, caring for, and propagating similar wildlife or any closely related wildlife.
- 3) Indicate your willingness to perticipate is a cooperative breading program or to contribute data to a studbook.
- 4) Describe the type, size and construction of all containers wildlife will be placed in during transportation or temporary storage, if any, and the arrangements for feeding, watering, and otherwise carries for it during that period.
- 3) Provide a detailed description of all mortalities during the preceding 3 years in volving the species covered in the application and held by the applicant (or any other wildlife of the same genus or family held by the applicant), including the causes of such mortalities and the steps taken to evoid or decrease such mortalities.

Federal Fish and Wildlife Service Permit Application Endangered/Threatened Species

Applicant: U.S. Army Corps of Engineers

Missouri River Division

P.O. Box 103 Downtown Station

Omaha, NE 68101-0103

Purpose: This endangered species permit is requested in order to initiate and fulfill the U.S. Army COE's piping plover and least tern objectives for the Missouri River in FY-1993. These objectives include gathering and analyzing data to support the implementation of the November 14, 1990, biological opinion for the operation of the Missouri River Mainstem system (system) and to compare current year information with that from previous years. In addition, the objective is to enhance the productivity of least terms and piping plovers with a primary focus to meet fledge ratios as required in the biological opinion.

Permit Effective Date: April 15, 1993 to December 31, 1993

Data gathering and research activities will be conducted within the Missouri River Mainstem system on the following reaches. Corps personnel who will be in charge of each reaches survey's include:

> Casey D. Kruse- T&E Field Specialist Lewis and Clark Lake Office Yankton, SD

Doug Latka- Endangered Species Specialist Missouri River Division Omaha, NE

LAKE SAKAKAWEA, NORTH DAKOTA - RIVER MILE 1568.0 TO 1390.0 Greg Pavelka- Lake Sakakawea Office

GARRISON REACH, NORTH DAKOTA - RIVER MILE 1389.0 TO 1295.0 Bill May- Bismarck Office
Joe Hall- Lake Oahe Office

FORT RANDALL REACH, SOUTH DAKOTA - RIVER MILE 880.0 TO 845.0 Casey D. Kruse- Lewis and Clark Lake Office Cory Sylliaason-Lewis and Clark Lake Office Terry Cowman- Lewis and Clark Lake Office

LEWIS AND CLARK LAKE, SOUTH DAKOTA/NEBRASKA

- RIVER MILE 844.0 TO 830.0

Casey D. Kruse- Lewis and Clark Lake Office Cory Sylliaason-Lewis and Clark Lake Office Terry Cowman- Lewis and Clark Lake Office

GAVINS POINT REACH, SOUTH DAKOTA/NEBRASKA

- RIVER MILE 811.0 TO 754.0

Casey D. Kruse- Lewis and Clark Lake Office Cory Sylliaason-Lewis and Clark Lake Office Terry Cowman- Lewis and Clark Lake Office

Permit Justification:

With this permit application we are requesting to conduct piping plover (Charadrius melodus) and least term (Sterna antillarum) habitat use surveys, population censuses and productivity estimates. Also to use predator deterrent techniques designed to enhance plover and term nest success and chick survival within the Missouri River and its impoundments proper. The techniques and methods of implementation proposed herein have been used successfully by both U.S. Fish and Wildlife Service personnel and South Dakota State University graduate research assistants within the Missouri river basin (Schwalbach 1988, Dirks 1990, Kruse 1993).

HABITAT USE SURVEYS

We propose to use methods similar to Schwalbach (1988) to evaluate piping plover and least term use of particular habitat types. Surveys will allow trend data to be collected and compared to past surveys to determine, if any, shifts in breeding population concentrations, habitat type use and number of active nesting sites or colonies within each individual reach. Surveys may also aid in determination of habitat condition by a reduction in use or abandonment of a particular site due to vegetation encroachment.

Surveys will be conducted from 1 April through 30 June, with the aid of a boat, cance, or other motor vehicle or on foot.

Binoculars and/or spotting scopes will be used to document presence or absence of plovers and terms. If a piping plover or least term is observed to be actively scraping or mesting, the site and corresponding river mile, habitat type and vegetation structure will be recorded, and the site considered active. Active term and plover mesting colonies will be recorded on U.S. Army COE aerial mosaic maps.

BREEDING ADULT POPULATION CENSUS

We propose to conduct population censuses simultaneously on all river reaches from 21 June to 2 July. This would aid in standardizing population counts with previously conducted annual surveys (Schwalbach 1988 and Dirks 1990), and would provide a synchronous census without overlap in counts that result from bird movements.

Censuses would be conducted with the aid of a boat and binoculars or spotting scope. Total counts of adults present will be used as the census count with active breeding adults being recorded as

twice the number of active nests and broading pairs. On sites with large nesting colonies where bird activity makes actual counts improbable, the census count will be recorded as twice the number of active nests and broading pairs.

PRODUCTIVITY SURVEYS

Nesting Success

We propose that active sites be searched to determine number and success of nests including principle causative factors responsible for nest lost. Each colony would be searched for nests on foot or with the aid of binoculars. Nests would be located by observing adult behavior or by systematic searches of colony sites (McIvor and Griffin 1986, Flemming 1984, Schwalbach 1988). Each nest would be identified by placing a numbered, wooden tongue depressor (Smith 1987) within five meters of the nest.

Information collected from each nest would include number of eggs and stage of incubation, nest fate, nest location and nest elevation (obtained with the use of surveyors stadia rod and transom) (Dirks 1990). Incubation stage of clutches will be estimated by an egg floatation technique (Hays and Lecroy 1971) modified by Schwalbach (1988). Cause of nest termination would be recorded as hatched or destroyed, with hatched nests being determined by presence of piping fragments or chick excrement in the nest bowl or by the location of hatched eggs positively identified to be from a specific nest (Dirks 1990). Destroyed nests will be identified to a principle causative factor including, but not limited to, flooding, erosion of nest site, weather, human disturbance, and predation (Reardon 1951). Determination of nest fate would be greatly aided by the identification of individual eggs. We request the use of a nontoxic felt pen or soft-lead No. 2 pencil to write the nest number on both ends of each egg in a clutch (Mitchell and Custer 1986, Dirks 1990). Nest initiation dates, hatching success, number of eggs hatched and number of nest initiations per breeding pair will be obtained from this data.

Chick Survival

We propose that chick survival be recorded as an index to productivity within the study sites. The biological opinion states fledge ratio goals of 1.44 chicks/pair for piping plovers and 0.70 chicks/pair for least terms. We believe correct estimates of these ratios are essential to evaluate the success of efforts applied towards meeting the opinion's goals. Chicks would be monitored during each colony site visit, and would be aged by visual observation of primary feather development. In an effort to standardize methods used to determine a chicks age and subsequent classification as fledged or unfledged, we request that known age chicks be photographed for the development of a

field techniques manual to be used by seasonal employees. These photographs are currently not available.

In definition fledged chicks should have acquired flight; however, because twenty plus day old piping plovers and fifteen plus day old least terms have a high probability of fledging (USFWS 1988), we will classify them as fledged juveniles. Attempts will be made to document chick losses due to weather, flooding, predation, human disturbance or any other factor.

PREDATOR DETERRENCE

Predator Exclosure Cages

We propose placing predator exclosure cages over nests of piping plovers on Missouri River sandbars to reduce predation by terrestrial and avian predators. Predation has been identified as the major factor impacting plover and tern nest success and chick survival within the Missouri River basin and northern great plains (Haig and Oring 1988, Mayer and Ryan 1991, Kruse 1993). Forty-nine percent (n=81) of all known nest failures in 1991 and 1992, along the Gavins Point and Fort Randall reaches, were attributable to predation (Kruse 1993).

Predator exclosure cages have been used with excellent success for piping plovers throughout much of its breeding range (Rimmer and Deblinger 1990, Kruse 1993). The cages are made of 5-X 5-cm wire fencing material so as to allow easy access in to and out of the cage. Cages would be constructed of five 120- X 120-cm panels which would allow a minimum of 55-cm between nest bowl and cage edge; cages would be secured with wire hook stakes (Kruse 1993).

Exclosure cages would be installed on all plovers nests, and observed to confirm acceptance of the structure by the nesting pair. In an effort to maximize nest survival, cages will be erected as soon as nest is located, regardless of clutch completion. No differences in bird acceptance or changes in behavior were observed when cages were installed prior to clutch completion rather than after the clutch was complete (Kruse 1993). Exclosures will be removed immediately after hatching.

Strobe Light Systems

We propose to implement strobe light systems (SLS) to enhance chick survival on the Missouri River System. SLS's have been used previously on Missouri River sandbars, increasing fledge ratios to over 2.00 chicks/pair in both 1991 and 1992 (Kruse 1993). The idea of using strobe light systems as a deterrent to predation was conceived on the Atlantic coast where flashing channel buoys reduced owl and heron predation on common term (Sterna hirundo) nesting platforms(National Audubon Society 1990) SLS's are designed as a deterrent of ocular dependent nocturnal

chick predators, but their is evidence that they may also aid in increasing nest success (Kruse 1993). With the high incident of great horned owl predation evidenced on several Missouri River nesting areas, SLS's may be influential in providing protection and enhancing productivity on large nesting colonies.

Strobe systems will be constructed and installed similar to methods described in Kruse (1993) (See attachment). A maximum of ten strobe light systems would be installed in 1993. Systems would be assembled after nesting sites have been established and only on areas where substrate conditions and island geomorphology make implementation practicle. SLS's would be maintained for the entire duration of the nesting season.

ENFORCEMENT

We propose that enforcement of endangered species laws and regulations, be carried out by state and federal enforcement entities. We will work closely with local South Dakota Game, Fish and Parks Department's Conservation Officers, North Dakota Game and Fish Wildlife Officers, Nebraska Game and Parks Commission Wildlife Law Enforcement Officers and U.S. Fish and Wildlife Service's Special Agents. We will carry out signing and posting of active nesting colonies to dissuade human disturbance (Dirks 1990), and provide maps of such colonies to the forementioned agencies for use in enforcement activities. We would also be available to assist in any routine enforcement schedule.

MISCELLANEOUS

We propose that all addled eggs and dead chicks and adults be collected and forwarded to the USFWS's South Dakota Ecological Services Office in Pierre South Dakota for proper disposal or analysis. Each sample will have its site and nest number recorded, along with its probable fate and date of termination.

We propose that active nesting colonies be checked at maximum 7-10-day intervals to determine nest fates and to search for new nests, chick survival and fledging success. All sites would be monitored until they were no longer occupied by either plovers or terms.

We propose that during all colony visits, efforts be made to keep disturbance to a minimum. To reduce exposure of eggs and young to excessive heat or cold, colonies would not be visited during days when ambient air temperature exceeds 90 degrees F(>32C), during periods of rain, winds in excess of 20 mph (>32 kph) or other adverse weather conditions. Visits would be limited to 30 minutes per colony with survival and nesting success of the birds always placed above the requirement to follow survey procedures and/or schedules (Fleming 1984).

- All on site activities will be undertaken concurrently with nest monitoring activities so that time spent inside a colony site will not exceed normal time that is required to conduct productivity surveys (Dirks 1990).
- If you have any questions concerning any of these proposed techniques or procedures please contact Casey D. Kruse at (402) 667-7873.

Literature Cited

- Dirks, B.A. 1990. Distribution and productivity of least terms and piping plovers along the Missouri and Cheyenne rivers in South Dakota. M.S. Thesis. South Dakota State University, Brookings, SD.
- Flemming, S.P. 1984. The status and responses of piping plover (Charadrius melodus ORD) to recreational activity in Nova Scotia. B.S. Honours Thesis. Acadia University.
- Haig, S.M., and L.W. Oring. 1988. Mate, site, and territory fidelity in piping plovers. Auk. 105:268-277.
- Hays, H., and M. Lecroy. 1971. Field criteria for determining incubation stage in eggs of the common tern. Wilson Bull. 83:425-429.
- Kruse, C.D. 1993. Influences of predation on piping plover and least term productivity along the Missouri River in South Dakota. M.S. Thesis. South Dakota State University, Brookings, SD; in press.
- Mayer, P.M., and M.R. Ryan. 1991. Electric fences reduce mammalian predation on piping plover nests and chicks. Wildl. Soc. Bull. 19:59-63.
- McIvor, L.H., and C.R. Griffin. 1986. Management, habitat selection and population dynamics of piping plovers on outer Cape Cod, Massachusetts. Mass. Coop. Wildl. Res. Unit Annu. Rep., Amherst. 39:17-26.
- Mitchell, L.A., and T.W. Custer, 1986. Hatching success of caspian terms nesting in the lower Laguna Madre, Texas, USA. Colonial Waterbirds. 9:86-89.
- National Audubon Society. 1990. Strobe lights deter predators. Egg Rock Update. 1990 Report. p.5.
- Reardon, J.D. 1951. Identification of waterfowl nest predators. J. Wildl. Manage. 15:386-395.
- Rimmer, D.W., and R.D. Deblinger. 1990. Use of predator exclosures to protect piping plover nests. J. Field Ornithol. 61:217-223.

- Schwalbach, M.J. 1988. Conservation of least terms and piping plovers along the Missouri River and its major western tributaries in South Dakota. M.S. Thesis, South Dakota State University, Brookings, SD.
- Smith, J.W. 1987. Improving the status of endangered species in Missouri (least term investigations). Missouri Department of Conservation, Columbia, Missouri. Endangered Species Project No. SE-01-12, 39pp.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Mountain-Prairie Region

MAILING ADDRESS:

Post Office Box 25+86 Denver Federal Center Denver, Cobrodo 80225 STREET LOCATION: 134 Union Blud. Lakewood, Colorado 80228

JUN 29 1993

ES/TE/Permit Subpermit 93-07A Mail Stop 60120

Colonel John Schaufelberger Missouri River Division U.S. Army Corps of Engineers P.O. Box 103, Downtown Station Omaha, Nebraska 68101-0103

Dear Colonel Schaufelberger:

This letter amends the authorization for you and designated members of your staff, as subpermittees (subpermit 93-07) under authority of permit PRT-704930, to conduct the following activities through December 15, 1993, for the purposes of enhancing propagation and survival and scientific research under the following conditions.

Survey for piping plovers (<u>Charadrius melodus</u>) and interior least terms (<u>Sterna antillarum athalassos</u>) in nesting areas along the Missouri River and its tributaries and elsewhere in South Dakota, Montana, North Dakota, and Nebraska to determine habitat use, nesting success, and productivity.

- Surveys for piping plovers and interior least terms will be conducted when ambient temperature is below 90 degrees Fahrenheit.
 - a. Surveys of each colony will be completed within 20 minutes.
 - 5. Up to three surveys may be conducted to determine when the first territorial or breeding piping plovers or interior least terms have occupied a breeding territory. When the first territorial birds are found on a colony, the condition of 2.b. will take effect.
 - c. Piping plovers and interior least terms will be observed from a distance of 200 feet or greater during mesting and brood rearing.
 - d. Nesting piping plovers and interior least terms and those observed returning to their nests are not to be disturbed.
 - e. Surveys may be conducted using motor vehicles, canoes, motor boats, or on foot. Searchers will remain at a distance of 30 feet or more from nests and will not handle eggs or nestlings.
 - f. Nest sites may be signed or fenced as needed to protect them from livestock and recreational vehicles.

- Conduct surveys for broads and nesting success.
 - a. Nests may be checked for success or failure at 5- to 7-day intervals.
 - b. No more than eight visits to determine reproductive success will be made to any colony during a breeding season.
 - c. Collect addled eggs from piping plover and interior least term nests for environmental contaminant analysis.
 - d. Collect any dead piping plovers or interior least terms found during surveys for contaminant analysis.
- Nests may be marked using inconspicuous dull wooden stakes, i.e., tongue depressors, wooden dowels, or small branches from brush or trees. Markers will be placed at least 30 feet from any nest.
- 4. When first found, or if nests are threatened, nest sites may be signed or fenced to protect them from livestock and recreational vehicles. Nests also may be covered using 3- by 3-foot square, 2-foot-6-inch high woven wire exclosures having 2-inch diameter wire mesh to protect them from predators.
- Erect predator exclosures at piping plover and interior least term nest sites.
- 6. Use flashing strobe lights mounted on fence posts or other structures to discourage predators.
 - Lights may be configured to light selected parts of nesting areas and should be timed to flash out of synchrony as described in the enclosed report "Strobe Lights Deter Predators."
- 7. Stage of incubation may be determined using egg floatation techniques described in:
 - Schwalbach, M.J. 1988. The Conservation of Least Tern and Piping Plover Along the Missouri River and its Major Western Tributaries in South Dakota. MS Thesis. South Dakota State University, Brookings South Dakota.
 - In Montana, not more than one fertile egg per nest may be floated to estimate stage of incubation.
- Except in the State of Montana, you may number eggs as needed using a No. 2 pencil or nontoxic felt-tipped pen as mentioned in:
 - Mitchell, C.A. and T.W. Custer. 1986. Hatching Success of Caspian Terms Nesting on the Lower Laguana Madre, Texas, USA. Colonial Birds. 9(1): pp 86-89.

FEDERAL FISH AND WILDLIFE PERMIT

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1. PERMITTEE

FISH & WILDLIFE SERVICE, REGION 6
REGIONAL DIRECTOR
P.O. BOX 25486, DENVER FED. CTR.
DENVER CO 80225

5. AUTHORITY STATUTES 16 USC 1539 (a) 16 USC 1533 (d) REGULATIONS (Affected) 50 CFR 17.22 50 CFR 17.32 1. NUMBER PRT-704930 4 RENEWABLE 5. MAY COPY χ₩ YES X X - *25 □ NO 7. EXPINES 6. EFFECTIVE 5/28/92 11/30/93

S. HAME AND TITLE OF PRINCIPAL OFFICER IN A 1 IS & DUSINGSE!

9. TYPE OF PERMIT

REGIONAL DIRECTOR

FNOANGERES/THREATENED SPECIES

12. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED

REGION 6

11. CONDITIONS AND AUTHORIZATIONS:

- A. GENERAL CONDITIONS SET OUT IN SUBPART DOF 50 CFR IZ. AND SPECIFIC CONDITIONS CONTAINED IN PEDERAL REQUILATIONS CITED IN 9LOCK AS ABOVE, ARE HEREBY MODE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONDITIONS, USED VALUE OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE PILING OF ALL REQUIRED INFORMATION AND REPORTS.
- S. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL OR OTHER FEDERAL LAW
- C. VALID FOR USE BY PERMITTEE NAMED ABOVE.
 - 9. Acceptance of this permit serves as evidence that the permittee understands and agrees to abide by the "Special Conditions for Marine Mammals and Native Endangered and Threatened Species" (copy attached).
 - E. Authorized to take listed species identified on the attached sheet for scientific purposes or the enhancement of propagation or survival, as prescribed by Service recovery documents, as specified in permittee's application and as conditioned below.
- F. Prior to conducting any activities not categorically excluded under the Service's NEPA categorical exclusions (516 DM 6, Appendix I) (e.g., killing, removal from natural habitat permanent impairment of reproductive capability),

Z. REPORTING ACQUIREMENTS

FIRST ANNUAL REPORT DUE 1/31/93 SUBMIT COMPLETE REPORT TO: OMA, 4401 N. FAIRFAX DR., ROOM 432 ARLINGTON, VA 22203, BY 1/31 FOLLOWING EA YR PERMIT IS IN EFFECT

ORIGINAL

ARLINGTON, VA 22203, BT 1/31 TOELOUTING E.

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- M. Taxonomic and other research studies may result in take of individuals or parts, and is authorized only as determined to be a necessary task in an approved recovery plan or recovery outline.
- N. This permit is conditioned upon strict construction of Mr. Wallenstrom's memo of 5/30/85 (copy enclosed).
- Subpermittee's may be designated in writing. A copy of each subpermit must be sent to: Office of Management Authority, 4401 N. Fairfax Dr., Room 432, Arlington, Virginia 22203.
- P. Subpermittee's must be required to hold and transport living specimens captured in the wild according to the provisions and procedures outlined in professionally established protocols for the handling and transport of the affected species.
- Q. All activities are to be coordinated with the Fish and Wildlife Service's Field or State Supervisor, Fish and Wildlife Enhancement. That office must be informed of all activities conducted under these subpermits.
- R. Procedures will be instituted to ensure that disease transmission does not occur during tissue sampling or other invasive procedures and that such activities are only performed by persons skilled in the techniques of handling and transport of the affected species.
- S. Pesticide analyses are authorized only to the extent of using specimens found dead as the result of legal, adjacent agricultural or public health activities. Any other such analyses are to use surrogate species.

SPECIES LIST FOR PRT-704930

BIRDS

Whooping crane (<u>Grus americana</u>): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting population and habitat surveys. Conduct habitat management activities and implementation of contingency plans.

Eskimo curlew (<u>Numenius borealis</u>): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting population and habitat surveys.

Bald eagle (<u>Haliaeetus leucocephalus</u>): Capture for radio-telemetry, blood sampling, banding, marking, transplant, reintroduction, and rehabilitation with the objective of conducting population monitoring, mortality, habitat, and chemical studies and to enhance eagle populations and their habitats.

Peregrine falcon (<u>Falco peregrinus anatum</u>): Capture for radio-telemetry, blood sampling, banding, relocation, captive propagation and reintroduction with the objective of conducting population monitoring, chemical analysis, and population augmentation and protection.

Arctic peregrine falcon (<u>Falco peregrinus tundrius</u>): Capture for radio-telemetry, blood sampling, banding, relocation, captive propagation and reintroduction with the objective of conducting population monitoring, chemical analysis, and population augmentation and protection.

Piping plover (<u>Charadrius melodus</u>): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting population and habitat surveys.

Interior least tern (<u>Sterna antillarum athalassos</u>): Capture for radiotelemetry, blood sampling, and banding with the objective of conducting population and habitat surveys.

MAMMALS.

Gray bat (<u>Mvotis grisescens</u>): Capture for radio-telemetry, blood sampling, banding, marking, census to determine distribution, population size, reproduction, food habits, habitat status, macro- and micro- habitat requirements. Take bats to determine pesticide levels.

Indiana bat (<u>Myotis sodalis</u>): Capture for radio-telemetry, blood sampling, banding, marking, census to determine distribution, population size, reproduction, food habits, habitat status, macro- and micro- habitat requirements. Take bats to determine pesticide levels.

MAMMALS (cont.)

Grizzly bear (<u>Ursus arctos</u>): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting studies on methods of controlling aggressive responses of bears towards humans. Aversive conditioning of selected bears may be conducted to reduce human-grizzly conflicts.

Utah prairie dog (<u>Cynomys parvidens</u>): Capture for radio-telemetry, blood sampling, banding, and relocation with the objective of conducting population and behavioral studies.

Black-footed ferret (<u>Mustela nigripes</u>): Capture for radio-telemetry, blood sampling, banding. Harass, harm, pursue, trap, capture, collect, or attempt to engage in these activities for tagging (fingerling ear tags and transponders), marking, inoculation, dusting, population and behavioral study, hold for captive propagation and release for transplant and reintroduction.

Gray wolf (<u>Canis lupus</u>): Capture for radio-telemetry, blood sampling, banding/tagging, and marking for studies of wolf ecology and behavior (population status, habitat use, food habits, dispersal, mortality factors, and habitat availability). Harass, harm, pursue, shoot, wound, kill, trap, and relocate for purposes of wolf control.

REPTILES

Desert tortoise [Scaptochelys (=Gopherus) agassizii]: Capture for radiotelemetry, collection of blood samples, and marking with the objectives of conducting status surveys, disease assessment, nutritional status assessments and basic life history studies for recovery purposes. In addition, harassment may result from habitat surveys. Specimens found dead may be salvaged, provided such death did not occur directly or indirectly as a result of permitted research. Accidental take of this species, in the form of injury, disease transmission, or death is NOT authorized. If such accidental take occurs, permittee must cease permitted activities and notify the OMA within 24 hours (703/358-2104). A written report must be submitted to OMA for review. Permittee may not recommence take activities until so authorized by OMA. A copy of all reports describing the results of disease studies should be sent to the National Wildlife Health Research Center, Madison, Wisconsin.

AMPHIBIANS

Wyoming toad (<u>Bufo hemiophrys baxteri</u>): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting population monitoring and survey, habitat monitoring, survey and manipulation, pesticide analysis, captive propagation and release, and reintroduction into historic habitat.

<u>INSECTS</u>

American burying beetle (=giant carrion beetle) (Nicrophorus americanus): Capture, color marking and release of live specimens to their original location for the purpose of determining the location, status, and movements of this species in Kansas, Nebraska, South Dakota and North Dakota. In addition, harassment of the beetle may result from habitat monitoring. Specimens found dead may be salvaged, provided such death did not occur directly or indirectly as a result of permitted research. Accidental take of no more than one specimen per state, in the form of injury or death is authorized during permitted research activities. If accidental take of more than one specimen per state occurs, permittee must cease permitted activities and notify the OMA within 24 hours (703/358-2104). A written report must be submitted to OMA for review. Permittee may not recommence take activities until so authorized by OMA. Not authorized to take for genetic sampling.

Uncompangre fritillary butterfly (Boloria acrocnema): Capture, using insect nets, insect traps, and hand-capture techniques for the purpose of taking voucher specimens, dye marking, tissue sampling, transportation, captive propagation, and reintroduction studies. Ongoing studies to determine the distribution and abundance of this butterfly are not expected to jeopardize this species, and may be conducted prior to completion of the the recovery outline. No more than three (3) butterflies are to be taken as youcher specimens from each of the San Juan and Sawatch Mountain Ranges. One butterfly per subpermit might be taken as a result of improper handling, stress and/or injury. Up to three such subpermits are anticipated. The incidental take is expected to be in the form of injury or death. The opportunity for incidental take to occur must be minimized. If the anticipated level of incidental take is exceeded, all operations must be stopped and you must immediately reinitiate consultation with OMA. Capture of butterflies can only be done by persons experienced in the techniques of handling lepidoptera species. Procedures used to mark individuals and to take tissue samples shall only be undertaken in a controlled environment and can only be performed by persons skilled in the techniques of handling lepidoptera species.

Pawnee montana skipper (<u>Hesperia leonardus</u> (<u>=pawnee</u>) <u>montana</u>): Capture with the objectives of conducting status surveys, captive propagation and release and reintroduction into historic habitat. In addition, harassment may result from habitat monitoring. Pesticide analysis is authorized only to the extent of using specimens found dead as the result of legitimate adjacent forestry or public health activities. Take to accommodate captive propagation and reintroduction activities is authorized only when habitat protection is not feasible (done only as a last resort), or as a specific task in an approved recovery plan. Accidental take in the form of injury or death is NOT authorized. If such accidental take occurs, permittee must cease permitted activities and notify the OMA within 24 hours (703/358-2104). A written report must be submitted to OMA for review. Permittee may not recommence take activities until so authorized by OMA.

FISH

Bonytail chub (Gila elegans): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting population and habitat monitoring and the collection of data on spawning success, reproduction, habitat use and quality, and taxonomy.

Virgin river chub (<u>Gila robusta seminuda</u>): Capture with the objectives of developing population status and habitat preference data. Incidental lethal take associated with these studies is not anticipated to exceed one (1) percent of the population.

Humpback chub (Gila cypha): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting population and habitat monitoring and the collection of data on spawning success, reproduction, habitat use and quality, and taxonomy.

Kendall Warm Springs dace (<u>Rhinichthys osculus thermalis</u>): Capture for radio-telemetry, blood sampling, and banding with the objective of determining taxonomic status.

Colorado squawfish (<u>Ptychocheilus lucius</u>): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting population and habitat monitoring and the collection of data on spawning success, reproduction, habitat use and quality, and taxonomy.

June sucker (<u>Chasmistes liprus</u>): Capture for radio-telemetry, blood sampling, and banding with the objective of conducting population monitoring, egg taking and translocation to safe refugia or cultural facilities.

Razorback sucker (<u>Xyrauchen texanus</u>): Authorized to capture using dip nets, electrofishing, and seines for radio-telemetry implants, numbered tagging, fin clipping, freeze banding, dye marking, blood and tissue sampling, transport, propagation, and reintroduction studies, provided, you meet the following conditions:

- 1. Studies to determine the status of the species and satisfy other recovery objectives are not expected to jeopardize this species, and may be conducted prior to completion of a recovery outline.
- 2. Authorized to incidentally take two razorback suckers per subpermit in the form of injury or death (not to exceed a total of 8 fishes between Regions 2 and 6) during the course of permitted research and management activities.
- 3. Report all deaths or injuries to Region 2.
- 4. All activities are to be coordinated with the Fish and Wildlife Service's Field or State Supervisor, Fish and Wildlife Enhancement.



DEPARTMENT OF THE ARMY MISSOURI RIVER DIVISION, CORPS OF ENGINEERS

P.O. BOX 103, DOWNTOWN STATION OMAHA, NEBRASKA 68101-0103



CEMRD-CW~PR

s: 30 November 1993

14 July 1993

MEMORANDUM FOR Commander, Omaha District, ATTN: CEMRO-OP (Rick Moore)

SUBJECT: Endangered Species Permit

- 1. Enclosed is the subject permit for surveying least terms and piping plovers on the Missouri River Mainstem system.
- 2. Please ensure that all permit conditions are adhered to. A report of all activities conducted under this permit should be forwarded to this office, ATTN: Doug Latka, no later than 30 November 1993.
- 3. If you have any questions please contact Doug Latka at 221-7281.

FOR THE COMMANDER:

Encl as

Chief, Planning Division

Civil Works and Planning Directorate

and Wildlife Service (Service). If the disposal of species is not identified in the above conditions, the Service's Assistant Regional Director, Law Enforcement, P.O. Box 25486, Denver Federal Center, Denver, Colorado 80225, telephone (303) 236-7540, will make the final determination on disposition of any threatened or endangered species taken during authorized activities.

- 4. A report of all activities conducted under authority of this subpermit must be submitted to the State Supervisor by December 3I, 1993. Your report should contain a complete account of activities conducted under this subpermit.-
- 5. A copy of permit PRT-704930 is enclosed; the conditions of this permit must be adhered to. This memorandum and the attached copy of permit PRT-704930 must be in your possession, or in the possession of designated members of your staff, while conducting all authorized activities.

If you have any questions about this authorization or need additional information, please contact the State Supervisor.

Sincerely,

John L. Spinks, da Deputy Regional Director

Enclosures



DEPARTMENT OF THE INTERIOR U.S. FISH AND WILDLIFE SERVICE

FEDERAL FISH AND WILDLIFE PERMIT

Page 1 of 5

AMENDMENT#

2. AUTHORITY STATUTES

16 USC 1539 (a) 16 USC 1533 (d)

1-2D1

(10.86)

REGULATIONS (ATTACHE)

50 CFR 17.22 50 CFR 17.32

J. NUMBER

-PRT-704930

S. MAY COPY 4. RENEWABLE YY YES XX YES □ NO ☐ NO

6. SFÆCTIVE 7. EXPIRES

> 4/-18/93 | 3/31/98

1. PERMITTEE

FISH & WILDLIFE SERVICE, REGION 6 REGIONAL DIRECTOR P.O. BOX 25486, DENVER FED. CTR. CO 80225 DENVER

S, NAME AND TITLE OF PRINCIPAL OFFICER (# FT & F DISPRES)

REGIONAL DIRECTOR

9. TYPE OF PERMIT

ENDANGERED/THREATENED SPECIES

18. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED

REGION 6

- 11. CONDITIONS AND AUTHORIZATIONS:
 - A. GENERAL CONDITIONS BET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 480VE, ARE HERESY MADE A PART OF THIS PERMIT, ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED DUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED, CONTINUED VALUETY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.
 - 8. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT DESERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL OR OTHER FEDERAL LAW
 - C VACIO FOR USE BY PERMITTEE NAMED ABOVE.
 - Acceptance of this permit serves as evidence that the permittee understands and agrees to abide by the "Special Conditions for Marine Mammals and Native Endangered and Threatened Species" (copy attached).
 - Authorized to take listed species identified on the attached sheet for scientific purposes or the enhancement of propagation or survival for approved recovery activities and as conditioned below.
 - Prior to conducting any activities not excluded under the Service's NEPA categorical exclusions (516 DM 6, Appendix I) the permittee must ensure that all NEPA requirements have been satisified. ...Continued...

ADDITIONAL CONDITIONS AND AUTHORIZATIONS ON REVERSE ALSO APPLY

12. REPORTING REQUIREMENTS

1/31/94 FIRST ANNUAL REPORT DUE SUBMIT COMPLETE REPORT TO: OMA, 4401 N. FAIRFAX DR., ROOM 432 ARLINGTON, VA 22203, BY 1/31 FOLLOWING EA YR PERMIT IS IN EFFECT

ISSUED EY

TITLE CHIEF, BRANCH OF PERMITS, OMA

4/8/93

ORIGINAL

BIRDS

Whooping crane (Grus americana)

Eskimo curlew (Numenius borealis)

Bald eagle (Haliaeetus leucocephalus)

Peregripe falcon (Falco peregrinus anatum)

Arctic peregrine falcon (Falco peregrinus tundrius)

Piping plover (Charadrius melodus)

Interior least term (Sterma antillarum athalassos)

MAMMALS

Gray bat (Myotis grisescens)

Indiana bat (Myotis sodalis)

Grizzly bear (Ursus arctos)

Utah prairie dog (Cynomys parvidens)

Black-footed ferret (Mustela migripes)

Gray wolf (Canis lupus)

<u>REPTILES</u>

_ Desert tortoise [Scaptochelys (=Gopherus) agassizii]

AMPHIBIANS

Wyoming toad (Bufo hemiophrys baxteri)

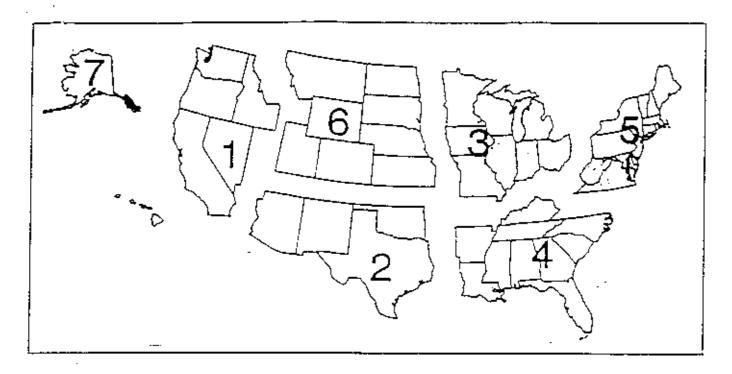
Kanab ambersnail (Oxyloma haydeni)

<u>INSECTS</u>

___ American burying beetle (=giant carrion beetle) (Nicrophorus americanus)

Uncompangre fritillary butterfly (Boloria acrocnema)

Pawnee montana skipper (<u>Hesperia leonardus</u> (=pawnee) montana)



<u>JURISDICTION</u>

Region 1: California, Hawaii Idaho, Mevada, Oregon, Vashington, American Samoa, Iommonwealth of the Monthern Pariana Islands, Guam, and the Pacific Trust Teritories

egion 2: Anizona, New Mexico, Kiahoma, and Texas

egion 3: Illinois, Indiana, qua, Hichigan, Hinnesota, issouri, Ohio, and Wisconsin

egion 4: Alabama, Arkansas, lorida, Georgia, Kentucky, puisiana, Mississippi, North srolina, South Carolina, ennessee, Puerto Rico, and the LS. Virgin Islands

egion 5: Connecticut, e(aware, District of Columbia, aine, Maryland, Massachusetts, aw Hampshire, New Jersey, New ork, Pennsylvania, Rhode pland, Vermont, Virginia and est Virginia

egion 6: Colorado, Kansas, ontana, Mebraska, North Dakota, outh Dakota, Uteh, and Myoming

egion 7: Alaska

REGIONAL DIRECTORS

- 1. Harvin Plenert Eastside Federal Complex 911 N.E. 11th Avenue Portland, Oregon 97232-4181 503-251-2234
- John Rogers
 P.O. Box 1306
 Albuquerque, New Mexico 87103
 S05-766-2321
- Sam Marter
 P.O. Box 45
 federal Building, Ft Smelling Twin Cities, Minnesota 55111
 612-725-3563
- 4. James W. Pulliam, Jr. 75 Spring St. SW, Rm. 1200 Atlanta, Georgia 30303 404-331-3588
- Ron Lambertson
 U.S. Fish & Wildlife Service
 300 Westgate Center Drive
 Hadley, MA 01035-9589
 413-253-8200
- Ralph Horgenwick
 P.O. Box 25486
 Denver Federal Center
 Denver, Colorado 80225
 303-236-7920
- Walter O. Stiegiltz
 1011 E. Tudor Road
 Anchorage, Alaska 99503
 907-786-3542

<u>EAW ENFORCEMENT</u> ASSISTANT REGIONAL DIRECTORS

- David L. McMulten
 Eastside Federal Complex
 911 W.E. 11th Avenue
 Portland, Oregon 97232-4181
 503-231-6125
- John E. Cross
 P.O. Sox 329
 Albuquerque, New Mexico 505-766-2091
- 3. Larry Mood Box 45 Federal Building, Ft Shelling Twin Cities, Hinnesota 5511: 512-725-3530
- Monty Kalcomb
 P.O. Box 4839
 Atlanta, Georgia 30302
 404-331-5872
- 5. A. Eugene Hester P.O. Box 779 Hadley, MA 01035-0779 413-253-8344 Permits: 413-584-4040 x-2817
- Terry Grosz
 P.O. Box 25486
 Denver Federal Center
 Denver, Colorado 80225
 303-231-5270
- 7. R. David Purinton
 P.O. Box 92597
 Anchorage, Alaska 99509-2597
 907-786-3311

D. SURVEY AND MONITORING

1993 AT-A-GLANCE PIPING PLOVER (CHARADRIUS MELODUS)

MISSOURI RIVER POPULATION SURVEY AND PRODUCTIVITY MONITORING

Fort Peck Reservoir (FTPKRES)	30	30	15	40.0	9	0.60	9
Fort Peck River (FTPKRIV)	2	1	1	0.0	0	0.00	0
Lake Sakakawes (LKSKRES)	5	3	11	27.3	34		
Garrison River (GARRIV)	125	86	69	31.9	23	1.07*	94
Lake Oahe, ND (LONDRES)	45	27	41	14.6	6		
Lake Oahe, SD (LOSDRES)	21	14	7	57.1	1	0.14	2
Fort Randall River (FTRLRIV)	12	12	4	50.0	0	0.00	0
Lewis and Clark Lake (LECLRES)	32	32	16	31.2	1	0.06	1
Gavins Point River (GAPTRIV)	109	109	54	68.5	58	1.05	58
TOTAL	381	314	218	39.0	132	0.84 f	168

- (A) Adults within areas monitored for productivity.
- (B) Nests hatched per 100 attempted.
- (C) Chicks observed to have fledged from areas monitored for productivity.
- (D) Chicks fledged per pair of adults on areas monitored for productivity.
- (E) Chicks fledged on the entire reach (fledge ratio X total adults).
- (F) Weighted average (each reach X corresponding fledge ratio).
- * Composite fiedge ratio due to movement of birds within reaches prior to adult census

1993 AT-A-GLANCE

INTERIOR LEAST TERN (STERNA ANTILLARUM)

MISSOURI RIVER POPULATION SURVEY AND PRODUCTIVITY MONITORING

							<u> </u>
Fort Peck Reservoir (FTPKRES)	7	7	3	0.0	0	0.00	0
Fort Pack River (FTPKRIV)	31	13	14	57.1	3	0.43	7
Lake Sakakawea (LKSKRES)	14	9	10	20.0	1		
Garrison River (GARRIV)	135	80	66	36.4	12	0.19*	22
Lake Oahe, ND (LONDRES)	82	49	65	4.8	0		
Lake Oahe, SD (LOSDRES)	41	38	13	38.5	0	0.00	0
Fort Randall River (FTRLRIV)	38	38	15	40.0	0	0.00	0
Lewis and Clark Lake (LECLRES)	76	76	54	37.0	37	0.97	37
Gavins Point River (GAPTRIV)	272	272	182	46.7	113	0.83	113
TOTAL	696	582	422	36.3	166	0.57 f	179

- (A) Adults within areas monitored for productivity.
- (B) Nests hatched per 100 attempted.
- (C) Chicks observed to have fledged from areas monitored for productivity.
- (D) Chicks fledged per pair of adults on areas monitored for productivity.
- (E) Chicks fledged on the entire reach (fledge ratio X total adults).
- (F) Weighted average (each reach X corresponding fledge ratio).
- * Composite fledge ratio due to movement of birds within reaches prior to adult census

MISSOURI RIVER INTERIOR LEAST TERN AND PIPING PLOVER POPULATION STATUS AND PRODUCTIVITY SUMMARY

The 1993 nesting season represented the initial effort by the Corps to undertake the survey and monitoring activities and to become actively involved from the field perspective in the recovery of these two species. Corps staff from four Lake Offices and three Natural Resource Offices were involved on seven of nine designated reaches of the Missouri River, conducting adult population surveys and productivity monitoring of nesting sites along nearly 500 miles of river and reservoir shoreline. In addition, the Corps provided funding for scope-of-work contracts with three USFWS-Ecological Services field offices, which surveyed and monitored an additional two reaches and part of a third involving 225 river miles.

Data collection was standardized through the development and use of basin wide data cards for nest sites, adult surveys, and chick observations. A guidelines manual for field personnel to use during piping plover and least tern survey and monitoring activities was developed and utilized during the field season. Training sessions covering proper field techniques, chick identification, juvenile aging, permit compliance, and record keeping was held for all staff involved with either the adult surveys or the productivity monitoring.

All work was conducted in compliance with the conditions of the endangered species research permit (Regional Blanket Permit PRT-704930, subpermit 93-07) issued to the U.S. Army Corps of Engineers, Missouri River Division, Omaha, Nebraska, by the USFW's Denver Regional Office to work on least terms and piping plovers within the Missouri River Basin during 1993, and with authorization of represented state game and fish department. Contracted agencies were individually permitted.

DESIGNATED STUDY AREAS

Study development included designating nine reaches historically identified as plover and tern nesting areas within the mainstem Missouri River, to be used as management units. These reaches were selected based on geographic location, hydrographic characteristics, and the ability to control or influence water elevations through dam releases. These nine management units include four riverine or lotic reaches and five reservoir reaches. Lake or field office responsible for adult censuses and productivity monitoring was determined by proximity to the given reach. Management reaches, agency and office conducting the surveys and monitoring activities during 1993, and

inclusive river miles of survey and productivity subsample areas are listed.

FORT PECK RESERVOIR (FTPKRES)

USFWS Charles M. Russell National Wildlife Refuge-Fort Peck Office Billings Suboffice, Ecological Services; Assisted by Corps Fort Peck Lake Office, Fort Peck, Montana

Adult Census:

River Miles 1785.0-1771.0

Productivity:

River Miles 1785.0-1771.0

RIVER BELOW FORT PECK RESERVOIR (FTPKRIV)

USFWS Charles M. Russell National Wildlife Refuge-Fort Peck Office Billings Suboffice, Ecological Services; Assisted by Corps Fort Peck Lake Office, Fort Peck, Montana

Adult Census:

River Miles 1712.5-1581.5

Productivity:

River Miles 1712.5-1673.0

LAKE SAKAKAWEA RESERVOIR (LKSKRES)

Corps Lake Sakakawea Natural Resource Office, Williston, ND

Adult Census: River Miles 1568.0-1480.5

Productivity:

River Miles 1505.0-1507.0

Corps Lake Sakakawea Lake Office, Riverdale, ND

Adult Census:

River Miles 1456.0-1389.6

Productivity:

River Miles 1452.0-1444.0, 1393.5-1393.2

RIVER BELOW LAKE SAKAKAWEA RESERVOIR (GARRRIV)

Corps Lake Sakakawea Lake Office, Riverdale, ND

Adult Census:

River Miles 1389.2-1341.2

Productivity:

River Miles 1377.5-1367.5, 1360.0-1350.0

USFWS Ecological Services-North Dakota Field Office, Bismarck, ND

Adult Census:

River Miles 1341.5-1299.7

Productivity:

River Miles 1328.5-1318.5, 1317.5-1307.5

LAKE OAHE RESERVOIR, NORTH DAKOTA (LOSDRES)

Corps Lake Oahe Natural Resource Office, Bismarck, ND

Adult Census: River Miles 1232.0-1299.0

Productivity:

River Miles 1296.5-1286.0, 1282.0-1272.0

LAKE OAHE RESERVOIR, SOUTH DAKOTA (LOSDRES)

Corps Lake Oahe Natural Resources Office, Mobridge, SD

Adult Census:

River Miles 1231,5-1165.0

Productivity:

River Miles 1190.0

Corps Lake Oahe Lake Office, Pierre, SD

Adult Census:

River Miles 1165.0-1110.0

USFWS Ecological Services-South Dakota Field Office, Pierre, SD

Adult Census:

River Miles 1110.0-1072.0

Productivity:

River Miles 1110.5-1110.0, 1104.0-1089.8

RIVER BELOW FORT RANDALL DAM (FTRLRIV)

Corps Lake Francis Case Lake Office, Pickstown, SD

Adult Census:

River Miles 880.0-845.0

Productivity:

River Miles 880.0-845.0

LEWIS AND CLARK RESERVOIR (LECLRES)

Corps Lewis and Clark Lake Office, Yankton, SD

Adult Census:

River Miles 845.0-811.0

Productivity:

River Miles 845.0-811.0

RIVER BELOW GAVINS POINT DAM (GAPTRIV)

Corps Lewis and Clark Lake Office, Yankton, SD

Adult Census:

River Mile 811.0-750.0

Productivity:

River Mile 811.0-750.0

GENERAL LIFE HISTORY AND HABITAT OBSERVATIONS

Due to the Cops commitment to attain training for all field personnel involved in the 1993 surveying and monitoring activities and the difficulty in coordinating a basin wide effort, initial habitat use surveys ere conducted one to two weeks later than when they typically occurred in the past. Least terms and piping plovers were found to be distributed through out the management units by the end of May - first week of June.

Habitat use surveys to locate active nesting colonies for monitoring purposes, were conducted with the aid of binoculars or spotting scope. Potential nesting areas were typically observed from a boat. Large islands or beach areas assessable from land were searched on foot using bird behavior to indicate active nesting colonies LKSKRES used a fixed-wing aircraft to locate nesting colonies on the extensive reservoir system found within this reach. Sites found to have terns or plovers actively exhibiting nesting ort courting behavior were recorded on U.S. Army Corps of Engineers aerial mosaic maps and monitored during production surveys. Habitat use surveys were conducted from the third week of May until the middle of July. By 15 July, successful colonies were assumed to be established and located nests were generally into the later stages of incubation with many successful adults brooding chicks.

FTPKRES: Habitat was in good condition upon the arrival of birds to the nesting areas within FTPKRES. Due to the continued drought and subsequent reduction of reservoir water levels at Fort Peck, shoreline habitat suitability may have exceeded that found during the previous years-nesting season. Plovers were noted to be present at the reservoir on 28 April with the earliest terns documented on 3 June. Nest initiation dates for piping plovers at FTPKRES ranged from 3 May to 11 June while least terns initiated nests from 11 to 18 June. Above normal precipitation during the spring and summer led to rapidly rising reservoir elevations at FTPKRES. A 17.3-ft increase in water level (2208.8 ft above mean sea level, 1 March to 2226.1-ft msl, 1 September) inundated past years nesting beaches and terminated many of the active low elevation nests. Nesting islands were further impacted by the high water as wave action likely destroyed several nests that were not completely inundated. Habitat conditions expected for the 1994-nesting season continue to deteriorate as water levels continue to rise. Beaches likely to remain exposed will have had six years of uninterrupted vegetative growth.

FTPKRIV: Quality of habitat on the FTPKRIV reach during the 1993 was comparable to that observed during past surveys. Below normal daily average discharges of 6600-7500 cfs from Fort Peck Dam resulted in several bare islands

and sandbars with crest elevations up to two feet above the water surface. The first least tern observed within the subsample area during 1993 was sighted on 27 May. Piping plovers arrived on the nesting area 9 June. Nest initiation dates for least tern nesting on the FTPKRIV reach ranged from 2 to 18 June. Piping plover initiated single nest within this reach on 6 July, 25 days later than any nest initiated by plovers on the FTPKRES reach. Habitat conditions within this reach during 1994 will be highly dependent on releases from Fort Peck Dam. High elevation sandbars have become vegetated due to lack of scouring flows.

LKSKRES: Least terms and piping plovers were well distributed throughout the historic nesting sites on the LKSKRES reach when surveys began on 27 May. Although both species were present at this time back-calculation of incubated eggs indicated that plovers began initiating nests during the week of 3 May while terms did not begin laying eggs until 13 June. The latest recorded nest initiations for plovers on LKSKRES during 1993 were on 13 and 17 June. Terns were observed to continue nest initiation as late as 10 July. Habitat condition on LKSKRES was very good for both species at the beginning of the nesting season. Low lake levels exposed large gravel-sand beaches, and several large gravel islands were available within the reservoir. Habitat had changed dramatically by completion of the nesting season. The majority of the nesting habitat available during the early part of 1993 was inundated by the rapidly rising lake elevations and many of the birds were forced to abandon this reach by the end of July. High elevations of many of these nesting areas during nest initiation aided early nesting plovers in fledging broods before inundation. Elevation of Lake Sakakawea rose from 1816.8 ft above msl on 1 March to 1837 ft above msl (20.3ft) on 1 September. Ridge Island in the Van Hook Arm of LKSKRES was 400 acres in size and 2.5 miles long on 1 June. At this time, twenty-eight adult piping plovers ere observed on the island. By August, Ridge Island had been reduced too slightly more than an acre. Full reservoir conditions coupled with efforts to maintain a stable pool during the spring for fish spawn in Lake Sakakawea, will make habitat availability extremely marginal for least tern and piping plover nesting during 1994.

GARRRIV: Below normal releases of 16,500 cfs daily average provided excellent nesting conditions during nest initiation periods along the GARRRIV reach. Extensive sandbar and island beach habitat was available throughout the reach when plovers began to arrive on the nesting areas in late April. Least terms were first observed 19 May. Nest initiation was documented as early as 8 May for plovers and the first week of June for terms. A record rainfall in mid-July inundated all sandbars downstream of the Heart River confluence near

Bismarck, ND and likely impacted recruitment of juvenile plovers and terms throughout the GARRRIV reach. Sandbar availability and habitat condition for the 1994 nesting season, if significant, could provide vegetation free nesting sites and increase chick survival by providing areas for brood dispersal during the fledging period.

LONDRES: Below normal pool elevations in Lake Oahe again resulted in good habitat conditions for both terns and plovers nesting within the headwaters region of LONDRES reach during the spring of 1993. Piping plovers had begun nesting activity prior to the start of monitoring in late May. Earliest nest initiation for plovers was calculated to be 13 May and 8 June for terns. Cold wet weather in late May and early June in this reach appeared to delay tern-nesting activity for nearly two weeks after the birds arrived on the nesting areas. As occurred on most reaches during the 1993 tern and plover nesting season, rapidly rising reservoir conditions, and high tributary flows terminated nearly all of the nest activity within the LONDRES reach. With reservoir pool levels expected to remain high during 1994, natural nesting habitat within the upper end of Lake Oahe may be nearly nonexistent.

LOSDRES: Lower basin precipitation and high late spring tributary flows caused earlier rises in lower basin reservoir elevations than what was experienced in the upper basin reservoir reaches (Lake Oahe - 1592.7 ft above msl on 1 March, 1610.7 ft above msl on 1 September). This increase in Oahe pool resulted in a nine-foot increase in elevation between the beginning of the 1992nesting season and the 1993-nesting season. Subsequently habitat conditions had deteriorated as water levels approached the vegetation on many of the historic nesting areas located on the LOSDRES reach. Both piping plovers and least terns were seen on the nesting areas when surveys started in the Mobridge area on 18 May, and in the Pierre area on 25 May. The earliest recorded nest initiation for plovers on LOSDRES during 1993, was 1 June with most birds initiating on or about 10 June. Least terns began initiating nests 8 June with the majority nesting on or about 18 June. Continued rise of reservoir surface elevation prematurely terminated all nesting activity on the reach by the end of July 1993. Habitat availability will be severely limited in 1994 if reservoir conditions remain the same. Many of the nesting area including the Blue Blanket area near Mobridge were completely inundated during 1993. Wave action and high waster scouring of vegetation should improve the condition of these areas for nesting when receding reservoir elevations again expose these sites.

FTRLRIV: Habitat conditions within the FTRLRIV reach remained

much the same as they have during the past several years during the early part of the 1993 nesting season. Very few high quality areas exist within this reach although sites that are available are typically quite large. Vegetation has impacted these areas above the elevations where water has been able to prevent new plant growth. Piping plovers and least terms were observed on this reach during an initial inspection trip 4 June 1993. Initial plover nest initiation was determined to have occurred on 3 June with terns initiating nests starting 15 June. Flood control measures, with releases being dramatically reduced during the first week of July, resulted in vast expanses of sandbar habitat being exposed throughout the FTRLRIV reach. Daily average releases from Fort Randall Dam were as low as 650 cfs for the period from 11 to 14 July. Water conditions within the river channel were so low that survey efforts were complicated during this time. Fort Randall releases in the period from 1 June though 31 August averaged 27% of normal. Observations that were conducted did not indicate as large a use of this habitat by re-nesting terms as one would expect. It is possible that this habitat became available too late for it to be utilized as nesting habitat in 1993.

LECLRES: Reconstructed habitat within the LECLRES reach was the primary habitat of choice for piping plovers and least terms during the early part of the 1993-nesting season. Plovers were distributed throughout the reach during habitat use surveys the third week of May, and began initiating nest on 8 May. Least terms were first observed on the LECLRES reach the last week of May and began to initiate nests 4 June. Large, newly aggradated sandbars, formed at the upper end of this reach during flooding of the Niobrara River, provided new nesting substrate for re-nesting terms after the water receded starting the first week of July. Twenty-three tern nests were initiated on the habitat in the upper reach during the period 1 through 8 July and birds continued to initiate nests until 20 July even though the lake peaked out at 1208.9-ft msl on 15 July due to flood inflows. Excellent nest and chick success was recorded for this reach during the later part of the nesting season as expansive sand flats developed with the continued recession of flood waters. Habitat should be in good condition within this reach for the 1994-nesting season.

GAPTRIV: The 1993 nesting season on the GAPTRIV reach was successful even though it contained both catastrophic flooding events on the lower part of the reach and record low water conditions during flood control activities on the upper part of the reach. An initial reduction of discharge from Gavins Point

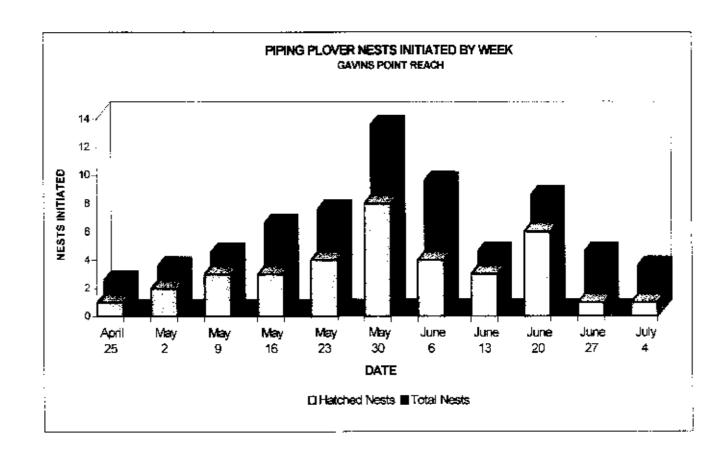
Dam to no more than 26,500 cfs for 12 hours every third day, provided habitat conditions similar to those seen along this reach during the past several nesting seasons. Vegetation has severely impacted availability of nesting habitat in this reach. Both tern and plover have been forced to nest on extremely low elevation sandbars that are periodically flooded by tributary inflow of off-season changes in dam discharges. Birds primarily nested on areas exposed by the reduction in flows with plovers initiating nests as early as 25 April and terns beginning to show up on the GAPTRIV reach during the first week in June. Large nesting colonies were established on the upper end of the reach where less tributary inflow resulted in more habitats being exposed. Peaking discharges for the birds was abandoned 27 June as tributary runoff between Yankton, SD, and Sioux City, IA continued to increase. Flood control measures to help reduce the record stetting flood stages on the lower Missouri River, reduced the amount of water being discharged into the river in late June. Habitat condition and availability greatly increased as the river elevation receded throughout July. This was a result of releases from Gavins Point Dam averaging only 28% of normal during to period from 1 July to 31 August. Habitat increased in the reach from approximately 13 small sites the start of the nesting season to nearly 600 acres late in July. Highly fluctuating tributary inflow from the James and Vermilion Rivers impacted nesting on the lower end of the reach, although much of the renesting effort was concentrated on the upper end near Yankton, SD, as habitat simply didn't exist below the confluence of the Vermilion River. Nesting success on these late nest attempts was actually similar to those earlier in the year and would have been higher if not for the nests lost to weather and flooding. Abundant habitat for brood dispersal, due to extremely low water conditions, led to excellent chick survival rates on several of the larger nesting colonies. Nearly forty fledged least tern chicks were seen in one flock staging on a sandbar near Yankton, SD. Habitat conditions on the GAPTRIV reach actually deteriorated during the 1993 sites and predicted high discharges for the reach will put nesting sites a premium for the 1994-nesting season.

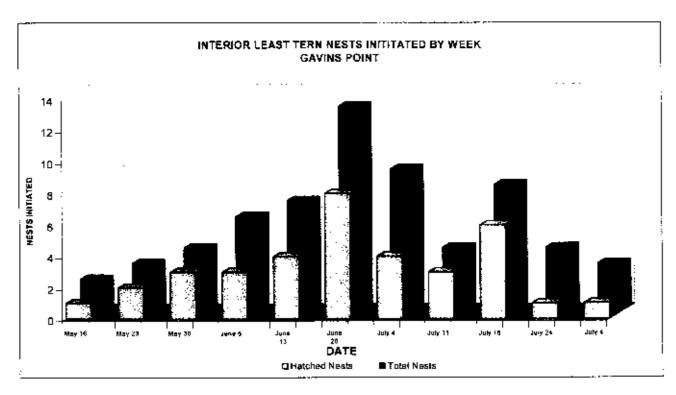
POPULATION CENSUS

The adult population census scheduled to be conducted throughout the Missouri River during the weeks of 27 June and 4 July was delayed until 24 July due to extended periods of rain, cold damp weather, and high wind. Weather conditions and drastic changes in nesting site distribution due to rising reservoir levels, complicated survey results. During the survey, many birds were recorded

as transient probably moving off of a flooded area. Survey in the FTPKRES, FTPKRIV, LOSDRES, FTRLRIV, LECLRES, and GAPTRIV were completed prior to emigration of adults off the breeding sites within these reaches. Survey results in the LKSKRES, GARRRIV, and LONDRES indicated that water conditions might have forced birds to emigrate out of the reservoir reaches and into the higher habitats of the riverine reaches prior to the survey. This is especially evident in the results of the LKSKRES census where only five adult plovers were counted but where 34 chicks were known to have fledged earlier in the year.

Census activities were conducted with the aid of a boat and binoculars or a spotting scope. Adults were counted either while incubating clutches, loafing on a sandbar, or flying near natal areas. If heavy vegetation existed on an area, preventing observation of adults, sites were entered, causing the birds to flush where they were then counted in the air. On sites with large nesting colonies, where bird activity makes actual counts improbable, the census count was recorded as twice the number of active nests plus the brooding pairs. Date, time, observers, and site location was recorded during entry of each census record.





ANNUAL PIPING PLOVER POPULATION COUNTS, 1986-1993

Survey	1993	1992	1991	1990	1989	1988	1987	1986
Reach								
FORT/PECK HESERVOIR	(30)	26	25	22	12	30	10	16
FORT PECK RIVER	2	0	13	17)	11	, 5	T	der der Maria (1964) in der
Lake Sarahawea	5	108	(150)	132	57 Y	743 A	/	
GARRISON RIVER	125	77	121	71	86	113	160	139
DAKE DAHE MEGA	66	(143)	87	88	140	.55	4 4	4 V
FORT RANDALL RIVER	12	12	45	31	0	31	16	11
LESANS IL CLASSILLANE	(32)	1	112	11	18	0	Ø	O
GAVINS POINT RIVER	109	111	165	144	122	212	177	172
TOTAL	381	478	618	516	446	569	367	342

ANNUAL LEAST TERN POPULATION COUNTS, 1986-1993

Survey Reach	1993	1992	1 9 91	1990	1989	1988	1987	1986
FORT PECK SECRETORIA	7	9	(10)	G	4	3	4	
FORT PECK RIVER	31	110	66	92	51	, 18	1	
STATE OF THE REAL PROPERTY.	44	79)	6	76	15 V	7 (/ · · · · · · · · · · · · · · · · · · ·	
GARRISON RIVER	135	198	195	174	122	142	175	171
CORE CORE	123	124*	(123	100	97	92	24 6	18 V
FORT RANDALL RIVER	38	20	62	6 7	4	45	60	25
COMICS VARIABLE ARE	76	22	25	21	29	.0	0	
GAVINS POINT RIVER	272	186	193	166	210	252	232	181
TOTAL	696	689	702	632	532	549	492	393

 \bigcirc

REACH HIGH



PARTIAL SURVEY

PRODUCTIVITY AND RECRUITMENT OF FLIGHTED CHICKS

Productivity monitoring provides a standard of measurement onto which success or failure of implemented management practices can be evaluated. The most critical scale of any recovery effort must be rated with the return gained from annual reproductive efforts or in the recruitment of young to the adult population. No matter how much habitat is created or prudent measures implements, nothing will recover piping plover and least tern populations unless annual prductivity exceeds annual mortality. In light of this, fledge ratio goals (number of juveniles produced annually per pair of breeding adults) were established by the Biological Opinion to give the Corps a target to meet in implementing management activities on the Missouri River. Correct estimates of these ratios are essential to evaluate the success of efforts applied towards meeting recovery goals. Every effort was made to accurately collect and all aspects of the productivity monitoring activities durng 1993.

Ties identified thhough early habitat-use surveys to contain active nesting colonies (except on the FTPKRIV and GARRRIV reaches where productivity was geograpically subsampled), were revisitited every 7-10 days during the duration of the summer to record nesting activity and chick survival. Active nesting sites were searwhed to determine number of nests and principle causative factors responsible for any nest being prematurely terminated. Each colony was searched on foot with the aid of binoculars. Nests were located by observing adult behavior or by doing systematic searches of the colony site. Each nest was identified by placing a numbered wooden tongue depressor with five meters of the nest. Nests were relocated every 7-10 days until the nest was terminated. All on-site activity was limited to 30 minutes or less including any passive predator management.

Information collected from each nest was recorded on a standardized nest card and included number of eggs, stage of incubation-obtained through use of the egg floatation method, nest fate, nest location, and nest elevation (only for highest and lowest nest on the site). Cause of nest termination was recorded as hatched or destroyed, with hatched nests being determined by the presence of piping fragment or chick excrement in the nest bowl. A nest was considered successful if it hatched a single eff from the clutch. Cause of nest fate on large nesting colonies was greatly aided by identifying all eggs in active nests with the nest number written on both ends of the egg with a ono-toxic pen. Destroyed nests were identified to a principle causative factor including but not limited to flooding, weather, human distubance, predation, and abandonment.

Chick survival was recorded during weekly nest searches of nesting areas. As the breeding season progressed, efforts were consentrated on locating chicks and keeping track fo fledged chicks using natal areas. Chicks were fypically flushed ahead of observers on the nesting sites and were aged by viual observation of size and primary feather development. Care was taken to prevent chicks from fleeing into the water inefforts to escape from the observers. Chicks were tracked during the fledging period by recording each observation on a chick record sheet. Because of the high probablity of fledging before the next week's visit, twenty-two day old plovers and 15 day old least terms were considered fledged.

The 1993 breeding season proved to be extremely difficult for plovers and terns particularly within the reservoir reaches. Results of the 1993 production surveys are given for plovers and for terns. Flooding and weather are the dominant factors identified to have severely impacted recruitment of chicks to the flighted population. The reservoir water level at FTPKRES increased 6.2 feet between the earliest nest initiation date and the last nest termination date. resulting in the inundation of all tern nests and eight of 15 plover nest. Strong winds accompanied with rain, along with flooding of the Milk River in Montana, drowned or killed by exposure, at least nine tern chicks and destroyed several other nests along the FTPKRIV reach, despite a rduction in releases from Fort Peck Dam. Rising lake levels on the LKSKRES reach destroyed 55% of the plover nests and two-thirds of the tern nests along with flooding three nearly fledged plovver chicks in Hoffland Bay. GARRRIV reach had extremely wet, cold, conditions during much of the nesting season and several chicks were presumed to have been lost to exposure. Flooding of tributary rivers impacted many of the nesting istes especially below the Heart and Knife Rivers, even though releases from Garrison Dam were reduced to compensate for higher flows. This may also 3xplain many of the unknown nest fates recorded in the reach. LONDRES and LOSDRES suffered nearly complete losses of nesting efforts due to the unusually rapid rise of this resevoir. It is difficults to explain the abrupt cessation of nesting within the FTRLRIV reach between 1992 and 1993. Vast amounts of habitat, available after drawdown during flood control measures, apparently did not attract terns. Difficulty in river navigation and greatly reduced survey effort may wxplain some of this change in tern and plover use of the reach. Inability to get to nesting sites prevented fates from being determined on many of the nests located within the FTRLRIV reach in 1993. Predation, unusually nonexistent on other reaches during 1993, severely impacted first nesting plovers and terns on artificial habitat within LECLRES

reach. One-hundred percent of the first 16 nests on this reach were destroyed by mink and raccoon predation. Re-nesting activity started after the Niobrara River receded, exposing vast areas of unconsolidated sands. One tern colony initiated 12 nests at River Mile 839.0 laying 27 eggs the f9irst week of July. Twenty-six chicks fledged from this sanbar during August. Severe flooding on the lower end of GAPTRIV reach was compensated for by excellent nesting and chick survival on colony sites at the upper end of the reach. Although predator presence on natal areas did not appear to be related to the vast size of the sandbars used for brood rearing. Continued decline of reservoir erleases from Gavins Point Dam during the later portions of the nesting season, exposed large areas of sand adjecent to the nest site sandbaars, and allowed wide-spread dispersal of pre-flight chickds. Basin-wide fledge ratios declined for the piping plover to 0.84 chicks per pair, well below that needed to establish a stable population. Least tern fledge ratio, similar to total population numbers, increased in 1993 to 0.57 chicks per pair, highest ratio on the Missouri River mainstem since the 0.64 recorded in 1988 and 1989.

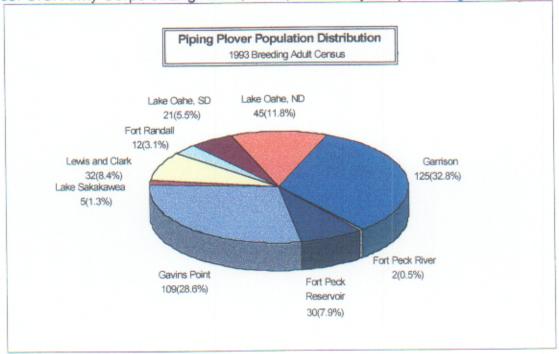
OTHER ACTIVITIES AND MANAGEMENT ACTIONS

PREDATOR AVERSION

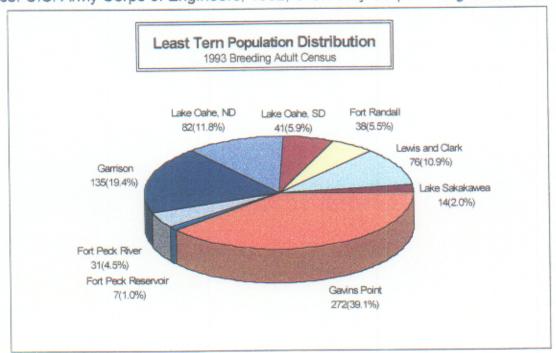
Predator exclosure cages were utilized on five of the nin reaches to increase survival of piping plover nests. Cages were assembled on site during the time allwed for productivity monitoring activities. Hands were washed with no scent soap prior to the handling of any cage components. Cages used on the LKSKRES, GARRRIV, and LONDRES were consturcted of 2" X 4" welded wire mesh and held in place with four electric fence t-posts. Assembly and instalation time was approximately five minutes. Cage used on LECLRES and GAPTRIV were constucted of 2" X 2" welded wire mesh and held in place by sic 14" wire hook stakes, assemny and installation time was similar. No apparent avoidance of caged nests by piping plovers was detected. Results of cage use during 1992 are listed by reach below.

LKSKRES 1 cage		1 flooded	0.00% nest success
GARRRIV 15 cages	10 hatched		0.67% nest success
LONDRES 14 cages	6 hatched		0.43% nest success
LECLRES 14 cages	4 hatched	8 flooded	0,26% nest success
GAPTRIV 38 cages	29 hatched	6 flooded	0.76% nest success

Source: U.S. Army Corps of Engineers, 1992; U.S. Army Corps of Engineers, 193b



Source: U.S. Army Corps of Engineers, 1992; U.S. Army Corps of Engineers, 193b



MAINSTEM MISSOURI RIVER PIPING PLOVER PRODUCTIVITY MONITORING, 1993.

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88.7	4 00
F 91 5	130
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A + 4 + 4 + 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5	38
NESTS EGGS 1	195
1 4 4 5	218
MILES MILES 39 5 86.8 86.8 86.9 35.0 35.0	378.0
FTPKRIS FTPKRIV LKSKRES GABRIV LONDRES G FTRLRIV LECLRES GAPTRIV	

a Rounded up to represent complete pairs.

0.84 84

157

3.2

Subsampled reaches.

o incomplete reporting.

 \star Composite fledge ratio due to movement of birds within reaches prior to adult census,

MAINSTEM MISSOURI RIVER LEAST TERN PRODUCTIVITY MONITORING, 1993.

0.00 0.00 0.00 0.00 0.00 0.97 0.83	
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ADULT PAIRS 8 40 40 19 19 136 136	
2.3 2.6 1.9 1.9 2.0 2.0 2.2	
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LINE O O O B B O O	2 <u>5</u>
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II I	*
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FEG 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	86.3
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1 1 2 4 6 0	- l - l
3 7 37 14 37 16 66 52 66 52 65 119 65 119 0 65 100 0 64 1	\ _}
S B S S S S S S S S S S S S S S S S S S	GAPTRIV 61.0 TOTAL 378.9
FIPKRES FIPKRES FIPKRES CARRIV CONDRES COSDRES COSDRES COSDRES COSDRES COSDRES	GAP TOT

a Rounded up to represent complete pairs.

Subsampled reaches.

o incomplete reporting.

Composite Redge ratio due to movement of birds within reaches prior to adult census

D-20

E. HABITAT WORK AND MAPPING



Photo 7: This aerial photo shows erosion protection of nesting areas on the Missouri River.

SUMMARY OF HABITAT ACTIVITIES FOR AOP PERIOD AUGUST 1992 - JULY 1993 The following is a summary of habitat work conducted, or funded, by the Corps of Engineers between August 1992 and July 93.

Lake Peck:

Burning of reservoir beaches planned by the U.S. Fish and Wildlife Service was not carried out.

Missouri River downstream from Fort Peck Dam:

Three sets of paired "Schwimmenkampen" floating modular units were installed at three locations in April, 1993. Island units were placed on existing low elevation islands, and sand was "mounded" around them, simulating natural contours. It was hoped that these islands would provide a floating surface to combat flooding caused by tributary inflow in this section of the river. One of the islands did float up off the island, and another was almost floating during higher flows during the summer. Wooden tern decoys were placed on two of the three island units. The local sand used as substrate on the islands was very fine and had a tendency to blow off. The islands were unused by the birds this season. There was no nesting in the vicinity of the island units either. However, nesting densities were low in this area. Island units have recently been taken off the low elevation islands and placed on the shoreline for the winter. They will be re-installed in the spring.

Vegetation was burned on the Deepwater Bay Entrance Island during April, 1993. Willows (5 - 15 feet tall) were also cut down, and oyster shell was experimentally placed on two locations.

Missouri River below Garrison Dam:

Vegetation was removed on several river islands using a glyphosate-based aquatic herbicide, sickle mower, cutting (woody saplings), and burning. In addition, snow fence was again used to create dunes and to fill in low areas on islands. These actions took place during the fall of 1992.

Missouri River downstream from Fort Randall Dam:

Vegetation was removed from three river islands using a glyphosate-based aquatic herbicide during the fall of 1992. Sand fences were also installed during the fall, 1992, but were scoured off by river ice.

Lewis and Clark lake:

Glyphosate-based aquatic herbicide was used to control vegetation on dredge islands during the fall of 1992. During the month of September, 1992, buildozers were utilized to push up sand from low elevation islands into higher "mesa" areas during a weeklong effort. Four of the islands were then armored with either standard burlap sandbags, or larger "shoreline erosion arrestor" (SEA) bags. This resulted in 10 new islands and one enlarged (dredge) island, totaling just less than 4 acres of safer nesting habitat for "peak" flow days and rises in lake elevation due to tributary inflow and rainfall events. These areas fledged one piping plover and 37 least terns. One floating island made up of 14 modular "Schwimmenkampen" units was installed in the extreme upper end of the take in April, 1993. There was vandalism to the island early in the year, and there was no use by terns or other wildlife.

Missouri River below Gavins Point Dam:

Island areas downstream from Gavins Point dam were pushed up to higher elevations using bulldozers during October, 1992. These activities resulted in two islands totaling almost 2 acres of high nesting habitat. This habitat was utilized by terms and plovers during the summer of 1993, fledging 8 plovers and 3 terms.

SPECIFIC INFORMATION ON HABITAT WORK BY REACH

Beginning in 1993, islands at the above-listed river miles were considered habitat maintenance areas where the Corps has already done habitat work, and now will continue to maintain habitat on these islands. Habitat maintenance was described as follows:

- Using Rodeo herbicide to control vegetation 1.
- Burning of dead vegetation 2.
- Armoring of existing islands with sandbags or SEAbags 3.
- Installation and removal of sand fences; placement of cyster shell or 4.
- Removal of large driftwood and other non-living potential predator 5.
- Minor sand-dune reshaping using hand tools, a small Bobcat, or 6.
- equivalent
- Mowing of vegetation
- Hand-cutting of woody saplings (< 4 inches, dbh) 7. 8.

Maintenance activities were scheduled prior to the arrival of the birds, after the birds leave, or on islands not being utilized by birds in a given year. The spring and summer of 1993 contained numerous storm events resulting in upper decibel inflows. Flood control measures from Gavins Point Dam resulted in less water being released, and therefore great expanses of sand for nesting habitat by midsummer. Habitat creation and maintenance included late October efforts, with assistance from the 200th and 854th Units of the South Dakota National Guard, inmates from the Yankton Federal Prison Camp, as well as numerous Corps staff. Nine sites at six island locations were created, totaling about 4 acres at RM 804.5-804.6, 803.8, 802.7, 801.5, 801, and 799.2. Sites were pushed up to an average of 46 inches above existing elevations using heavy equipment (D6 and D7 bulldozers, front-end loader). In addition, approximately 18 acres of habitat was mowed, with 7 of these acres available for 1994 nesting. The remaining acres needed spring herbicide treatment prior to the nesting season. SEA bags were placed on the upstream ends of RM 803.8 and 801.5. Residual vegetation remaining after mowing at RM 801 was burned using a flame-thrower.

Habitat efforts in this reach began during April 1992, with the creation of five small LEWIS AND CLARK LAKE dredge islands in the extreme upper end of Lewis and Clark Lake near Springfield, South Dakota. One floating island made up of 14 modular Schwimmenkampen units was installed in the extreme upper end of Lewis and Clark Lake in April, 1993. The island was partially assembled on land, then towed out into the lake and anchored. The modular units were topped with gravel for use as tern nesting habitat. Driftwood and shade boxes provided shade, since the gravel could get extremely hot. To avoid being a navigation hazard, anchored buoys with the nautical hazard

symbol were also installed in the vicinity of the island. The buoys came with solar-controlled blinking strobe lights to inform night-time boaters, and to control necturnal predation, should the island be used for nesting. There was vandalism to the island early in the year, and there was no use by terms and plovers.

GARRISON REACH

During the fall of 1993, islands at RM 1351 and 1368 had sand fences installed for sand dune creation. Oyster shell was placed on the newly formed dunes to prevent wind erosion. Islands at RM 1371.1 (2.8 acres) and 1373.5 (6.4 acres) had Rodeo treatment to remove vegetation.

FORT PECK REACH

In April 1993, three sets of paired Schwimmenkampen floating modular units were installed at three locations downstream from Fort Peck Dam. Island units were assembled, topped with local sand, and placed on existing low-elevation islands in the river. Sand was mounded up along the island units, simulating natural contours. As the highest points on the islands, it was hoped that these islands would provide a floating surface to combat flooding caused by tributary inflow in this river reach. The islands were successful in floating when the remaining island habitat was inundated by tributary inflow, but were not used by the birds. Wooden tern decoys were placed on two of the three units. The local sand used as substrate on the islands was very fine and had a tendency to blow off. Islands were removed in the fall, to avoid ice damage.

FORT PECK RESERVOIR

The Corps again assisted the Service in burning vegetation on Fort Peck Reservoir during 1993.

Summary of non-habitat activities from August, 1992 through July, 1993

Tern and plover monitoring

The Corps has hired a Tern and Plover Field Coordinator to head up monitoring efforts in the Missouri River basin. Personnel from corps lake offices and assisting agencies (state game offices, U.S. Fish and Wildlife Service, several tribes) attended workshops organized by the Field Coordinator outlining surveying and monitoring techniques. Methods were standardized, as were data collection sheets and data input. The Corps still contracted out a portion of the collection efforts, but the same methods and data sheets were used. Written Guidelines were developed and distributed to lake offices and assisting agencies.

Predator deterrence

Predator deterrence methods (predator cages and strobe systems) were again utilized in several reaches. Predator deterrence was expanded in the Missouri River below Gavins Point dam, with the purchase and assembly of four additional strobe units. Ideas for modification and improvement of strobe units are being pursued. APHIS animal damage personnel were contacted for predator assistance in South Dakota and North Dakota.

Information management

Historical-nesting locations for terns and plovers is being entered into a GIS database. Efforts were concentrated on the Gavins Point reach, since this is where the majority of the birds are located. A data management agency has been contracted to modify existing habitat management software for use on the tern and plover study, as well as to enter current and historical nesting data.

SCHWIMMKAMPEN

Germany's artificial floating islands

By Sven Hoeger



Volunteers plant schwimmkampen, some of which have already been assembled and are being positioned on an up-river portion of the Duehnn Reservoir near Cologne, West Germany.

LOATING islands are a natural phenomenon well known to those of us from places as different as the bogs of Minnesota and the lush Louisiana marshlands. These islands are formed by plant associations growing on the water's surface. They float because of the air stored in the roots, rhizoms, and leaves in most of the plant matter of which they are composed.

Growth of these floating islands occurs naturally only under conditions where the processes of decay are slower than the added growth that takes place during suitable seasons of the year. On a majority of lakes and ponds in the northern United States, floating-mat plant associations are rarely found. Occasionally, an overhanging section will break away from the shore and may float, but such floats are rather unstable and temporary in nature.

Artificial islands

During recent travels in Germany, I learned about artificial floating islands and the variety of uses to which they are put by environmental planners and conservation groups. These uses include:

- Bank erosion and shoreline protection.
- Wildlife habitat.
- ► Landscape design, planning, and management.
 - Water purification and filtration.
 - ► Biological disinfection.

Lothar Bestmann of Bestmann Ingenieur Biologie, an environmental engineering firm, discussed schwimmkampen with me. The term itself is a combination of schwimmen, to swim or float, and the somewhat retired Low German word kampe, which stands for a defined section of grassland; its closest English translation would probably be camp or campus. German environmentalists use this word when they talk about artificial floating islands.

At his company yard, several components of schwimmkampen were ready for shipping and subsequent deployment. Later, in his office Bestmann showed me photos of several islands and how they are being used.

Sven Hoeger, P.O. Box 597, Pawling, New York 12564. holds a "diploma" degree in applied botany from the University of Hamburg, West Germany.

Reprinted from the Journal of Soil and Water Conservation July-August 1988, Volume 43, Number 4 Copyright © 1988 Soil and Water Conservation Society He described to me his own schwimm-kampen in principle as aggregates of seven-foot-long equilateral triangles (I). Any number of such units or modules can be connected to form an island of just about any shape and size. The individual units come in two versions: vegetated or gravel-topped. They are constructed from welded piping (approximately I foot in diameter). The materials used, polyethylene, polyurethane, and neoprene, are all substances with unobjectionable chemical qualities: they are corrosion proof and resistant to aging (ultraviolate light) and destruction by microorganisms or pests.

The planting substrate is made from natural fibers and cork granules. The latter are for added buoyancy.

Each of these units is customarily planted with about 25 individual plants. The modules' dry weight is about 70 pounds. Even planted, their initial weight does not exceed 100 pounds. Thus, they can easily be carried by three persons. Gravel-topped modules can best be compared to floating trays with their center of gravity below the water's surface, the upper rim a few inches above.

The weight of individual modules and their uncomplicated assembly into islands makes it possible to deploy them in remote areas where access by vehicles, especially heavy equipment, is restricted, unwanted, or difficult. In meso and eutrophic environments, it reportedly takes about two years for the island's vegetation to develop fully and begin to spill over the edges. With the exception of a few inspections in the initial phase, schwimmkampen are virtually maintenance free.

For shoreline protection

Their stability and size make these islands a useful component in shoreline and bank protection efforts. Even in a small pond, breaking waves and their undertow contribute significantly to shaping banks and beaches. Usually, the impact of waves and related forces is buffered by a succession of different types of vegetation, which in marshes include submerged and floating leaf water plants; emergent hydrophytes, such as common reeds; and the variety of

grasses and herbaceous plants characteristic of wetland meadows. In swamps this last group of plants is replaced by brush and trees. The roots of all these plants retain the soil above and below the water level, while their upward growth softens the effects of wind and water.

Unfortunately, this natural bank protection is often not in place, as with newly dug retention ponds, waterfront construction sites, or where it has been destroyed by too much disturbance. Schwimmkampen help to protect the banks in the following ways:

► Emergent parts of plants on outlying, floating islands can form an effective windbreak.

➤ Their root systems weaken outbound currents in shallow coastal areas, thus slowing soil movement considerably.

► Their combined weight slows down the orbital movement of waves so that a calm water zone extends between the floating barrier and the shore.

Negative impacts are unknown, but efficiency is diminished on large bodies of water where waves can often only be broken by dams or jetties.

With the schwimmkampen in place, the conditions are more suitable for spontaneous growth of shore vegetation, which can be furthered greatly through additional ecologically sound planting efforts. A floating erosion barrier can be reused elsewhere after establishment of a sufficiently strong procetion zone seems guaranteed.

For wildlife habitat

When deployed as habitat islands, schwimmkampen serve as living space for many animal and plant species in a given body of water. Ordinarily they are aimed at attracting, aiding, and protecting waterfowl, but invariably mammals, reptiles, amphibians, and many invertebrates get drawn to them as well. Plant eaters, such as muskrats, may even have to be discouraged until vegetation is established enough to support their feeding. This can easily be accomplished by the application of wire mesh.

Below the island, in the rhizosphere, which may extend downward three feet or more, fish and fish fry find protection and ample spawning substrate.

A rowboat tows an artificial island to its anchorage. The units, all gravel-topped, are intended to provide migrating waterfowl with resting places in an area that does not have any natural beaches. Below, a colony of the common terns (Sterna hirundo) successfully raises their offspring on schwimmkampen on Lake Constance in a nature reserve called Wollmatinger Ried.

A multitude of invertebrates, such as insects, insect larvae, crayfish, and mollusks, as well as protozoans, bacteria, and algae all contribute their share to this floating ecosystem as decomposers, predators, and other elements in the food chain.

The constitution and density of an island's population can be influenced through appropriate choices of plants and module arrangements. Vegetated units can be interspersed with gravel-topped ones, and any or all can be separated by larger or smaller areas of open water. Of course, the size of the island determines its final population strength greatly.

In Germany, bird conservation groups have deployed schwimmkampen of varying sizes with great success. In some cases, birds accepted the islands immediately after they were launched. While most waterfowl prefer a combination of vegetated units for cover, feeding, and breeding, with gravelfilled units for resting, terns and other shorebirds take to larger aggregates of primarily barren gravel units that accommodate their need for unobstructed vision. Generally, habitat islands reduce the danger of disturbances and predation and have resulted in better safety for clutches and hatchings.

For landscape design, management

As a landscaping tool, schwimmkampen offer possibilities permanent islands cannot. Because they float, they do not take away storage capacity. That means they can be added to existing storage ponds and reservoirs without diminishing the function of





these water bodies. They also follow the water level, a property important in areas where levels fluctuate with seasons and water usage. Under such circumstances, natural marsh vegetation is rarely found because it cannot take hold.

Schwimmkampen also have been used to achieve dramatic aesthetic results where shore-retaining structures and the maintenance and inspection regulations that govern them have allowed only sparse and monotonous vegetation to exist. In Germany, gravel collection pits have long been dug without adequate environmental impact plans. Some have been retrofitted with artificial floating islands, resulting in an eco-

Fully developed vegetation (top), three years after deployment, grows well in the windy North German lowlands. This visual barrier of floating schwimmkampen on the river Havel in West Berlin (below) separates a nature reserve, the Moorlake, an ecologically important bay, from an actively used beach and heavy weekend boat traffic. logically favorable, eye-pleasing situation.

In public parks, offshore placement of schwimmkampen on lakes with heavy sports activities can also serve to protect valuable stands of marsh vegetation against arbitrary intrusion.

For water purification, filtration

Much research and experimentation remains to be done in the field of natural water purification and filtration. Even though many questions are still unanswered, in both Europe and North America a number of emergent marsh plants have already been put to use in municipal and communal sewage treatment facilities to help purify discharges of heavy metals and harmful chemicals, such as phenols, cyanides and other salts, and to buffer alkaline waters. These and other useful effects are characteristic of few select species whose resistance

or tolerance to certain environmental toxins proves to be high. Most commonly used are bulrush (Scirpus lacustris), cat tail (Typha spec), common reed (Phragmites communis), and yellow flag (Iris pseudacorus).

Planted on floating islands, the root systems are suspended into the body of water, forming a huge, three-dimensional labyrinth of roots. This mesh not only removes dissolved substances directly from the water, uninhibited by mud and soil, but also mechanically filters floating particles and retains them. In addition, the rhizosphere harbors countless bacteria that enhance the process of water purification with their activi-

When using schwimmkampen for water purification, it must be kept in mind that plants can only absorb and retain undesirable substances while alive and intact. Decaying plant matter will release the substances back into the environment. Periodic harvesting is, therefore, required to remove pollutants from the nutrient cycle.

For biological disinfection

One of the merits of the great bulrush (Scirpus lacustris) is that it exudes microbiocidal substances during the spring and early summer months (4). When tested, sites vegetated with bulrushes have proven to be free of such pathogens as coliform bacteria and salmonella (I). Even more importantly, it is possible for contaminated terns and sea gulls to rid themselves of infections with salmonella within days after they start nesting on such sites.

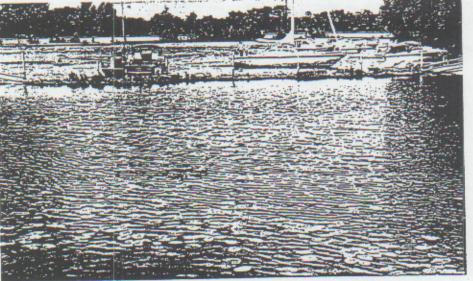
An added tool

Schwimmkampen have proven their value over the past eight years in Germany. There also has been some encouraging investigation by American scientists (2,3,5) that suggests these islands could easily be adapted to a variety of needs. Schwimmkampen offer an additional tool in our struggle to protect natural habitat alongside an expanding human population and infrastructure.

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Specifications: FLOATING ISLANDS

DIMENSIONS: Equilateral triangle with 100 inch sides

AREA: Surface of 30 square feet

HEIGHT: 10 inches

WEIGHT: 70 pounds

CARRYING CAPACITY: 400 pounds

Materials: Ultraviolet-resistant PVC tubing and sheeting form the framework and

bed of FLOATING ISLANDS. Additional chemically inert materials assure continued buoyancy. VEGETATED modules include separately packed medium PLANT PLUGS in selected species. GRAVEL-TOPPED module does not include gravel, but PVC tubing is covered by non-woven

nylon geotextile which provides good footing for waterfowl access.

Availability: We make every attempt to offer a complete selection in stock, but

orders are filled on a first come basis unless reserved by a deposit. For

large orders, three months advance notice is recommended.

Packaging: FLOATING ISLANDS are stacked and handled without additional

packaging. PLANT PLUGS accompanying VEGETATED modules are packaged separately in bags and/or boxes depending on quantity.

Shipping: Normal trucking by common carrier, on flatbeds or enclosed.

Storage: FLOATING ISLANDS may be stored in open air conditions.

Accessories: Fasteners required for joining multiple FLOATING ISLANDS are

included in needed quantities, separately packaged, at no additional charge. Medium PLANT PLUGS accompanying VEGETATED modules (28 plugs/module) are included, separately packaged, at no additional cost. Gravel for GRAVEL-TOPPED modules is not included and must be obtained separately; one module can carry up to 400 pounds of gravel. Anchors, anchoring lines, buoys, and other fixtures needed for installation are not included and must be selected according to site conditions

and obtained separately.

Prices: See attached price list for current prices and terms of payment.



P.O. Box 250, Boston, MA 02133 TE: 617/723-9404 FAX: 617/723-9430





FLOATING ISLANDS

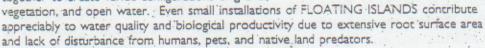
GENERAL USE:

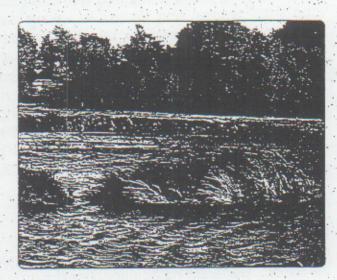
FLOATING ISLANDS provide vegetation, nesting sites, and shoreline protection on lakes; reservoirs, and detention basins where usual techniques are not practical. They can move with fluctuating water levels, do not decrease the waterbodies' storage volume, and offer habitat free from disturbance and predation via land. Vegetation installed into the

islands provides food and cover for waterfowl and also fish which use the underwater root zone. The many invertebrates and microbes which coexist with wetland plants complete the food chain and perform water purification processes often lacking in highly developed waters. Anchored offshore, they can slow the orbital movement of waves to reduce erosion. FLOATING ISLANDS are available in a multi-purpose vegerated model and a gravel-topped model ideal for resting and nesting use by many birds.



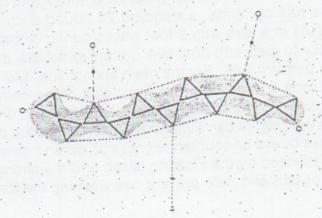
Constructed of PVC tubing and other durable, buoyant materials, FLOATING ISLANDS withstand exposure to ice, wind, and ultraviolet radiation. Once vegetation is established, little or no maintenance is needed and natural succession occurs. Multiple triangular units may be fastened together to create varied configurations of gravel,





LIMITATIONS:

FLOATING ISLANDS permit the establishment of vegetation regardless of shoreline instability, disturbance, or fluctuating water levels. However, where water quality is poorly understood, or inadequate to support plant growth, use of FLOATING ISLANDS is not advised.





FLOATING ISLAND LINKAGE

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BESTMANN GREEN SYSTEMS

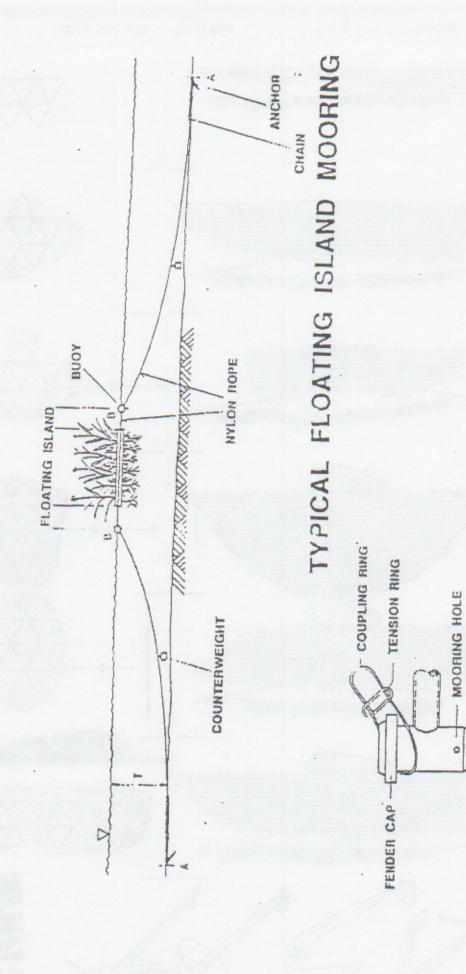
Each Floating Island is shipped with one thick fender ring, one large coupling ring, and one small tension ring for use in linking islands together to form habitat clusters. If additional rings are desired, they can be separately ordered. Floating Islands are right side up when the end caps are on the top sides of the corner posts. Stretch the fender ring over one corner post end cap: this shock absorbing ring keeps two adjacent corners spaced apart. Loop the coupling ring around the corner post of the island below the fender ring. Slide the tension ring over the coupling ring as shown in the connection detail drawing, then firmly pull the remaining half of the coupling ring over the corner post of the adjacent island. It is best to link islands on the shoreline or in shallow water, then tow the assembled clusters to the desired mooring location.

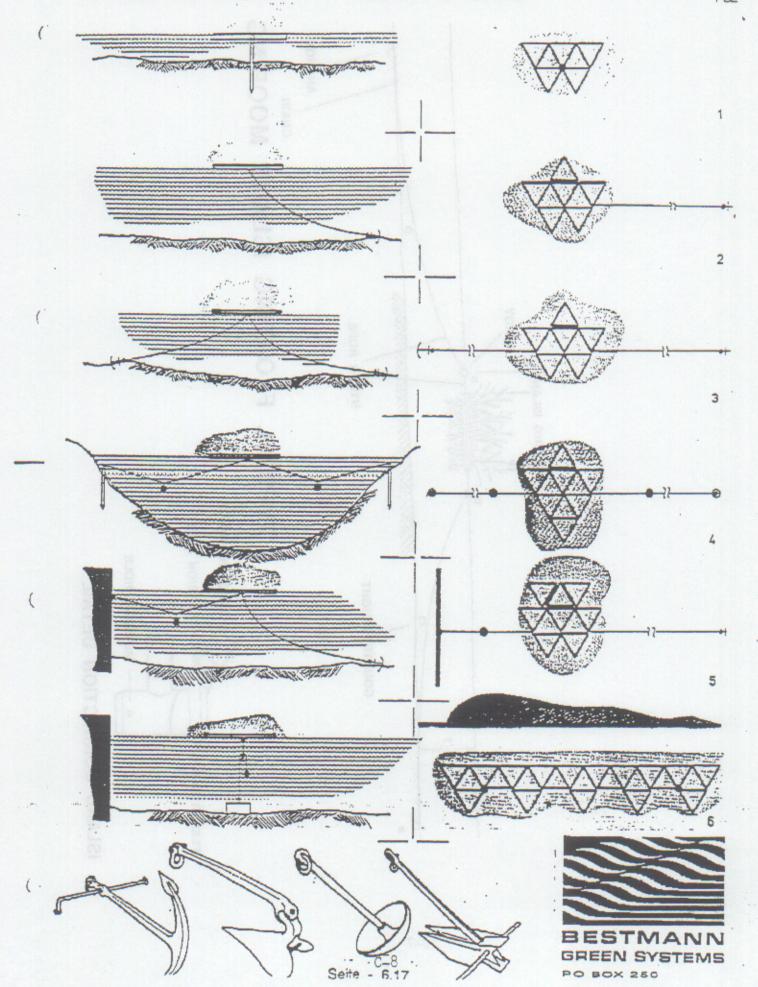
FLOATING ISLAND SURFACES

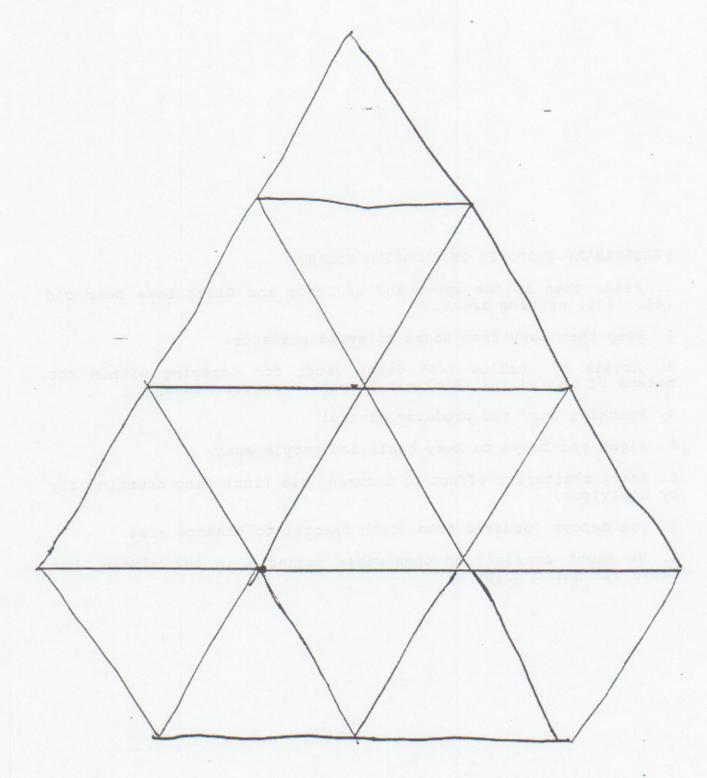
For vegetated models, place plants (either our medium Plant Plugs or your local materials equivalent to a 3" diameter pot size) in the 26 holes on the upper surface of the island. Generally no additional treatment is needed, however, vegetation may require protection during an establishment period in sparsely vegetated or overpopulated situations. For gravel-topped models, add locally obtained sand and/or gravel to a depth of 2-3" once islands are in shallow water. Sand/gravel surfaces may require periodic replenishment on sites with heavy use or high wave exposure.

FLOATING ISLAND ANCHORING

Floating Islands can be attached with various methods adapted to local configurations, use patterns, and available materials. Many unique solutions have been used to meet individual needs, ranging from weight and pulley systems or posts to keep the units in one position, to tie-downs on the shoreline. In general, it is useful to use anchors and lines which allow Floating Islands to move with fluctuating water levels and wave swells. As a rule of thumb, a standard 20 pound anchor will hold a mass of 8 linked Floating Islands in a lake with 2 foot waves during storms. Commercial anchors have the best ability to grab and hold lake bottom substrate, but concrete blocks and other materials can perform well. For the main anchor line, 1/2" nylon rope is generally suitable. Loop the rope through the mooring holes of the corner posts; and avoid chafing by using lengths of chain for sections which may drag the bottom. Use of buoys or counterweights can buffer the tension created in the anchor line by intense storm events. These buoys or counterweights bob up and down upon wave impact, softening the jolt experienced by the Floating Island and the anchor. These measures keep the anchors in position and help prevent overwashing the islands.







Arrange modules to maximize interior "dry" area, as in example above or similar arrangement

PRELIMINARY THOUGHTS ON FLOATING ISLANDS

- 1. Place them in the upper end of Lewis and Clark Lake near old (el. 1205) nesting areas.
- 2. Keep them away from shore to avoid predators
- 3. Access to shallow (<6" deep) water for foraging within 400 meters of island (per Biological Opinion requirements)
- 4. Blinking buoy for predator control
- 5. Signs and buoys to keep boats and people away
- 6. Heavy monitoring effort to document use (including courting/fly by behaviour)
- 7. Use decoys (ordered from North Dakota) to enhance area
- 8. We might consider an open-water triangle in the middle, but needs further thought

Photo 8: Assembly of the Swimmenkampen artificial island.



Photo 9: Assembly of the Swimmenkampen.



Photo 10: : Assembly of the Swimmenkampen.



Photo 11: : Assembly of the Swimmenkampen.



PIPING PLOVER & LEAST TERN PROGRAM 1993

FALL HABITAT CREATION PROJECT Gavins Point Reach - National Recreation River

Project Objectives

The 1993-fall habitat creation project was undertaken in concurrence with Omaha District's May 1993 long-term plan for habitat enhancement for the interior least tern and piping plover. Habitat development has become a vital part of the U.S. Army Corps of Engineers efforts to meet recovery goals of these rare species. Habitat availability will play a key role in the success of the Corps endangered species program, not only by reducing the impacts on productivity brought about by the lack of habitat, but also by providing a base for a population which can survive into perpetuity without artificial habitat regeneration.

Project Dates:

Mobilization - October 25, 0630 hours Demobilization - October 29, 1600 hours

Agencies Participating:

*U.S. Army Corps of Engineers
CEMRO-OP-N
CEMRO-OP-LC
CEMRO-OP-LF
CEMRO-OP-MR
CEMRO-OP-M

*South Dakota Army National Guard

109th Engineer Battalion - Sturgis, SD

200th Engineering Company - Chamberlain, SD

854th Engineering Company - Mobridge, SD

*U.S. Federal Bureau of Prisons
Yankton Federal Prison Camp

Dedicated Equipment and Operating Staff:

Boats

- Pontoon raft and support boats(SDANG) - 15 Guardsmen

- Chrysler tri-hull and John boat(LC) CEMRO-OP-LC staff Heavy Equipment
 - D7 Caterpillar dozer(LC) Ron Freng OP-LC, Operator
 - D6 Caterpillar dozer(LF) Neil Andersen OF-LF, Operator
 - TD15 International dozer(MR) Duane Blair OP-MR, Operator
 - 450 John Deere dozer(LC) Joe Navatril OP-LC, Operator
 - 4600 Ford tractor w/6' deck mower(LC) Prison Camp Trustee Operator
 - Ford f250 pickup w/110 gallon fuel tank(LC) Ron Brown, Operator OP-LC

Support Equipment

- 2 Honda trash pumps w/shoreline erosion arrestor(SEA)
 bags(LC) Allen Steinle & Brian Donahue OP-LC, Operators
 w/7 Prison Camp Trustees
- Panama flame thrower and 2 drip torches(LC) Allan Steinle OP-LC, Becky Latka PD-M, & Casey Kruse OP-N, Operators
- Stihl chainsaw(LC) Allan Steinle OP-LC, Operator
- Kawasaki 4X4 quadrunner(LC)
- W20 John Deere front-end loader(LC)

Pre-project preventative maintenance on equipment proved extremely beneficial, as equipment downtime during the week was limited to a broken drive belt on the deck mower.

Logistical Support

Bryan Bradley, Civil Engineer OP-LC, organized heavy equipment and heavy equipment operators.

Ron Brown, Outside Maintenance Foreman OP-LC, mechanical maintenance of equipment, delivered fuel and personnel transport.

Bob Schmitz, South Dakota Army National Guard, organized all guard detail and mobilization.

Becky Latka, Environmental Resource Planner, Planning Division, Omaha District, completed environmental assessments, obtained right-of-entry to islands, and coordinated National Guard participation.

Ed Brodnicki, Archeologist, Planning Division, Omaha District, provided guidelines to operators for environmental compliance with avoidance of potential archeological artifacts.

Casey D. Kruse, T&E Field Coordinator, Operations Division, Omaha District, responsible for project development, island selection, site design, and coordination of river logistics.

Habitat Constructed:

Nine site at 6 island locations totaling 3.87 surface acres (14.13 acre-feet) of habitat were created during 51 operating hours. Sites ranged in size from 1,750 to 36,250ft². Substrate was pushed up an average of 45.9 inches (range 32.0" to 62.0"), on sandbars with base elevations ranging from 2.0" to 22.0" (average 9.4"). 109 bulldozer hours resulted in 22,787 yd³ of material pushed up into new habitat.

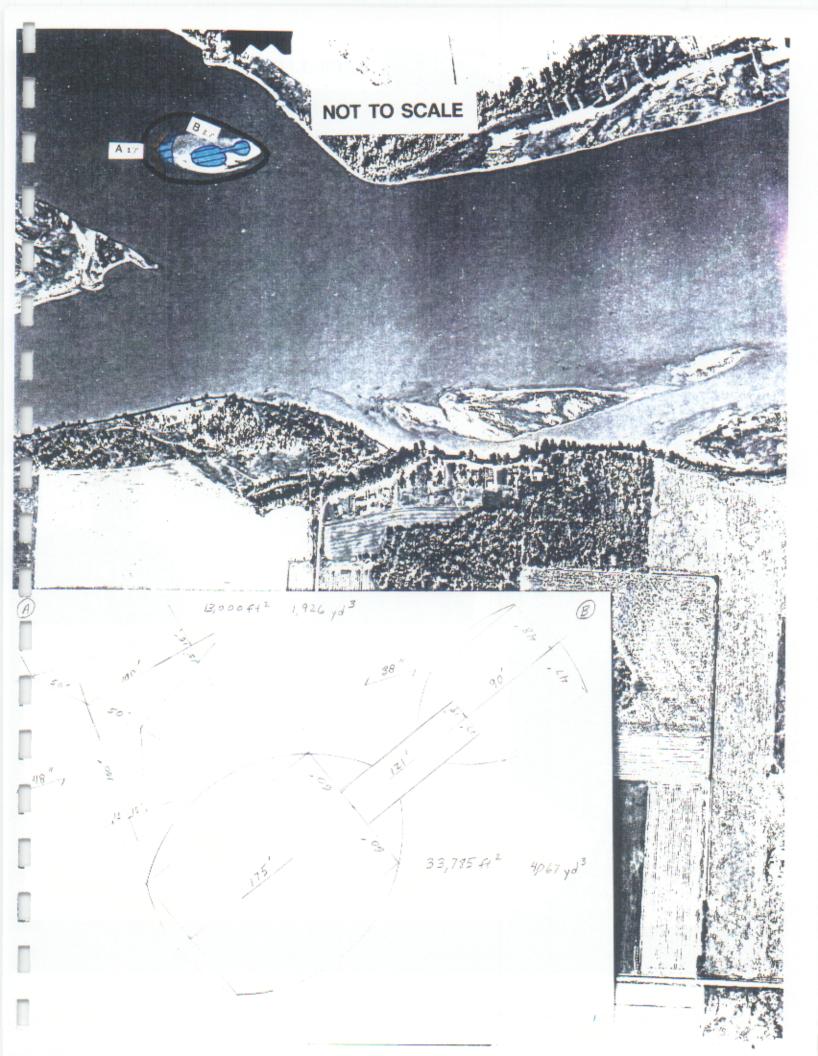
In addition, approximately 18.2 acres of habitat was mowed, of which, 7+ acres should be available for nesting during the 1994-nesting season. The remaining acres will need to be spring treated with a herbicide and residual organic material allowed decaying.

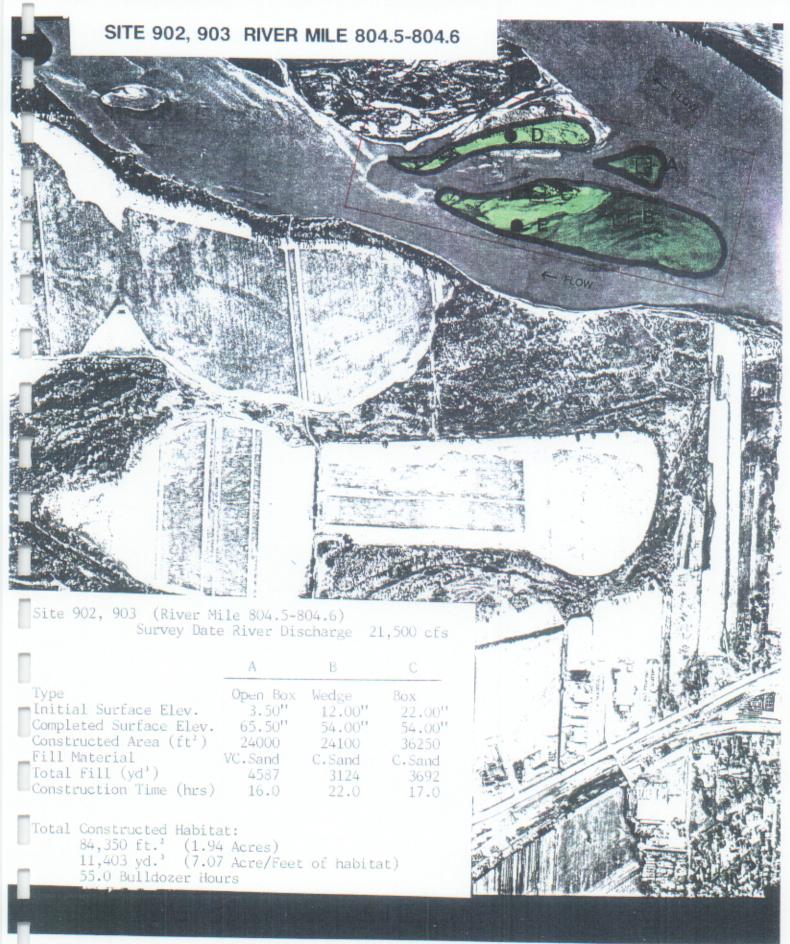
Comments:

- Pre-project recon trip essential for National Guard and should include a heavy equipment operator.
- Excellent radio communication between equipment operators, field coordinator, and raft facilitated fluid in-field operation.
- Experienced heavy equipment operators had big impact on the ability to move the amount of material that was developed and in shaping the sandbar surfaces to mimic natural sandbars.
- Overall, an excellent effort resulted in a very impressive habitat development project in 1993.

 Excellent feedback from equipment operators, National Guard, field crews, and the public provided the support for a very successful week.
- one limiting factor to keep in mind for future projects, is the availability of equipment. The guard would physically be able to transport and keep active nearly twice the amount of heavy equipment.

Casey D. Kruse Wildlife Biologist T&E Field Coordinator



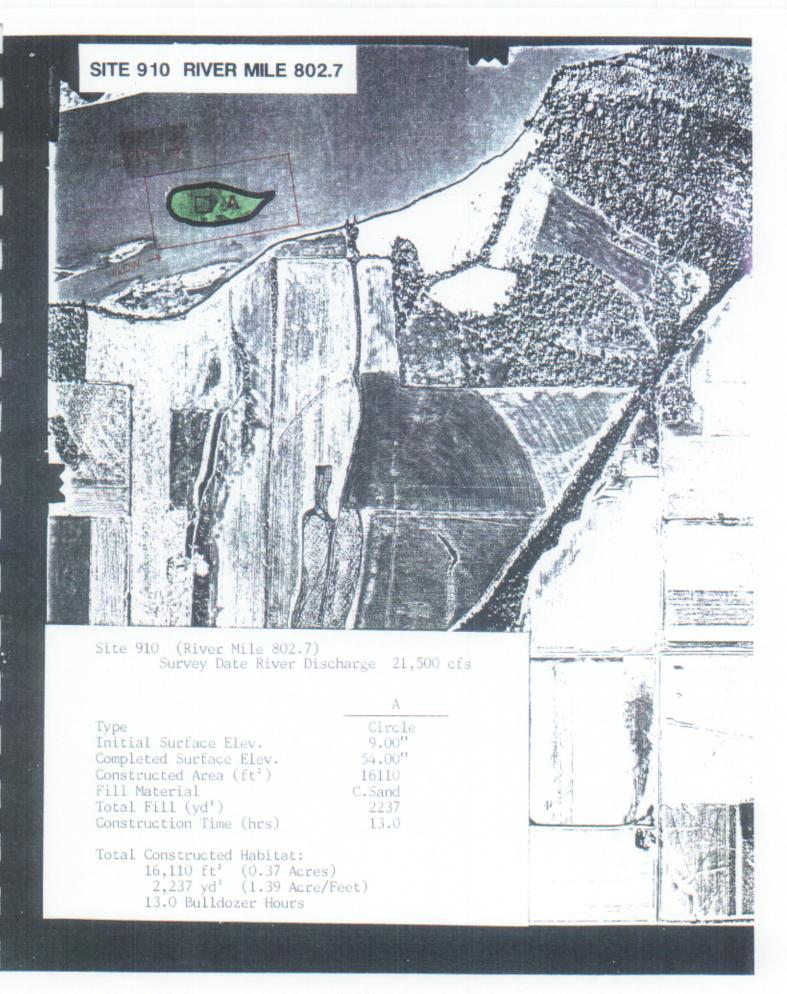


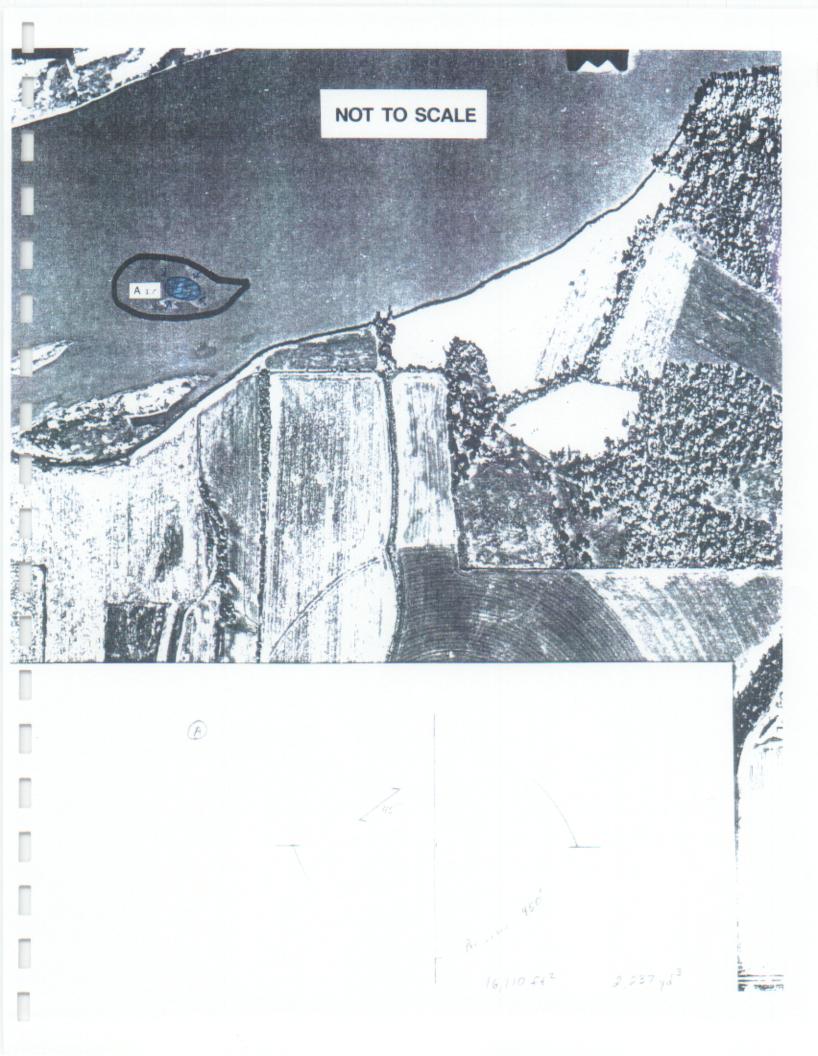
Note:

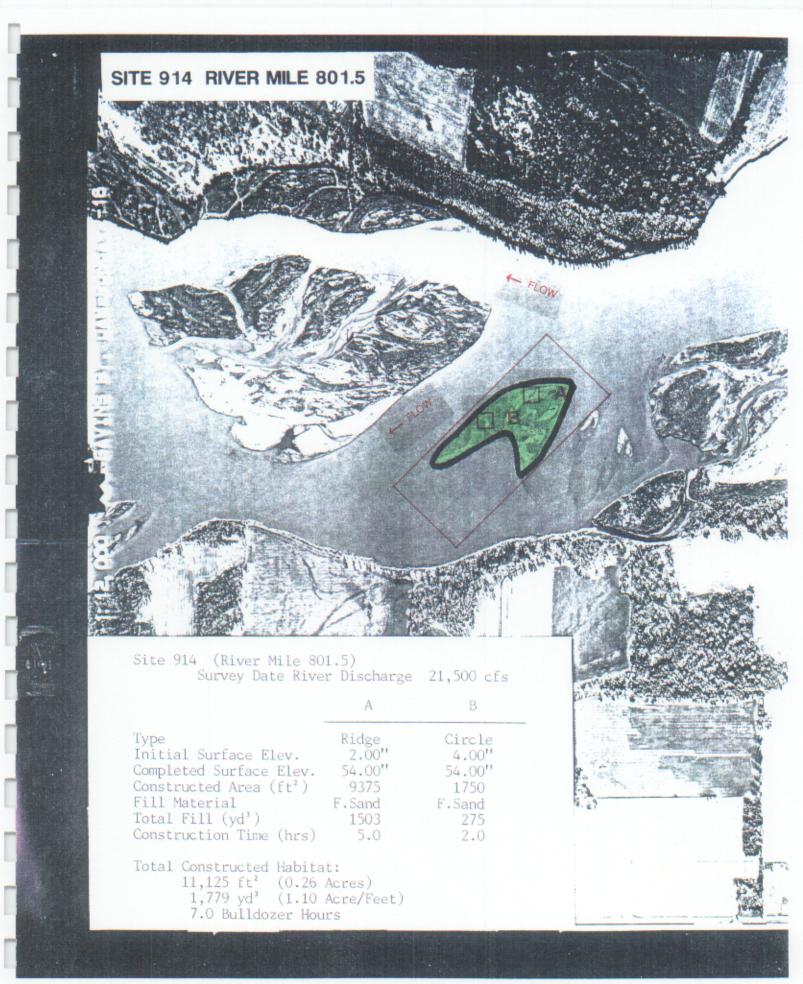
(1) Area D; 6.7 acres of early successional cottonwoods and willows cut with a brush hog mower. Approximately 3-4 acres will be available at 39,500 cfs.

(2) Area E; 4.0 acreas of mowed vegetation, approx. 1 acre available at 34,200 cfs.



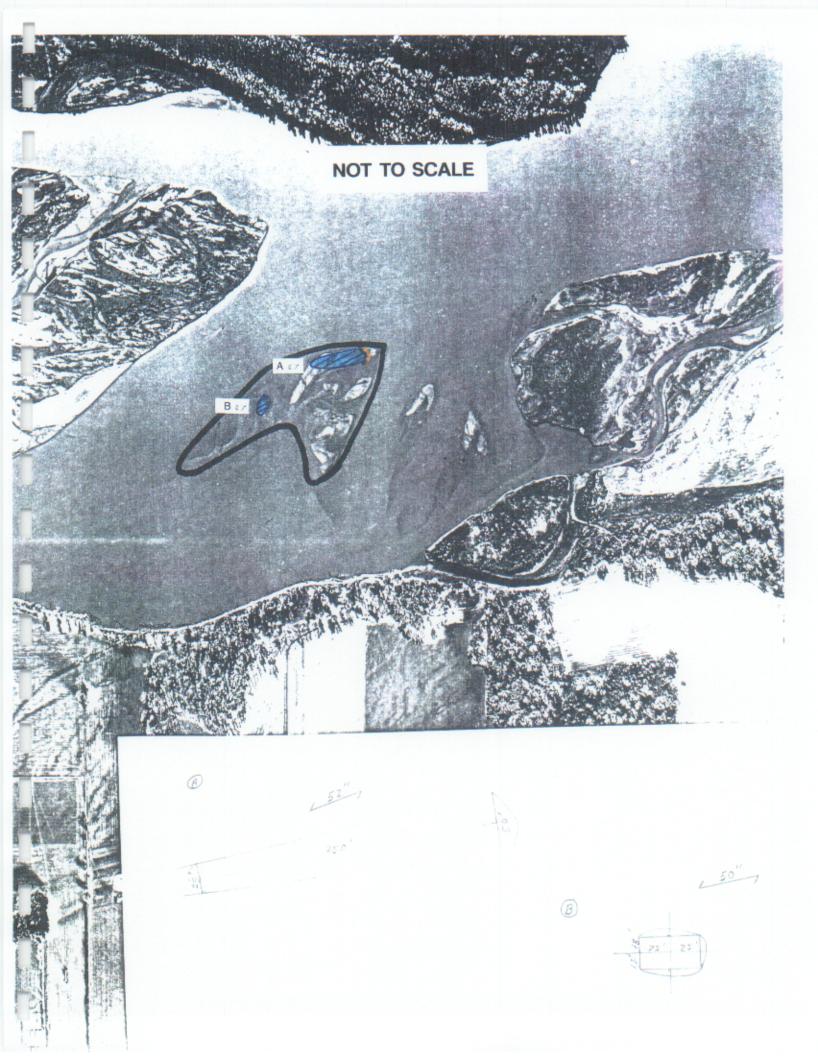


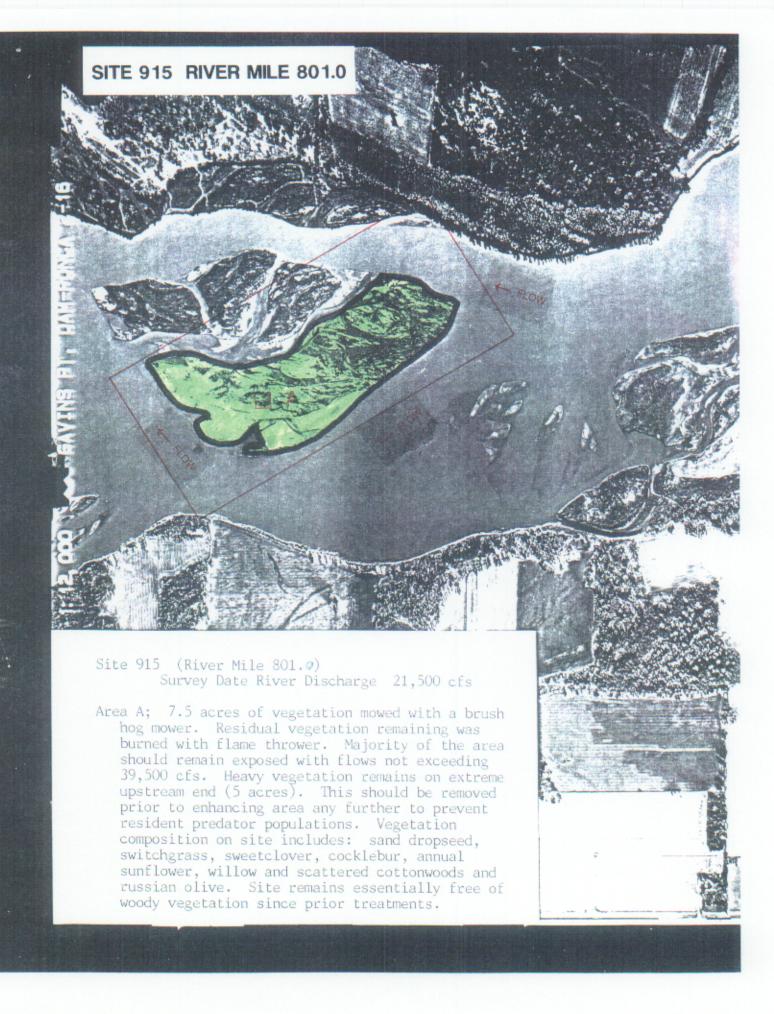




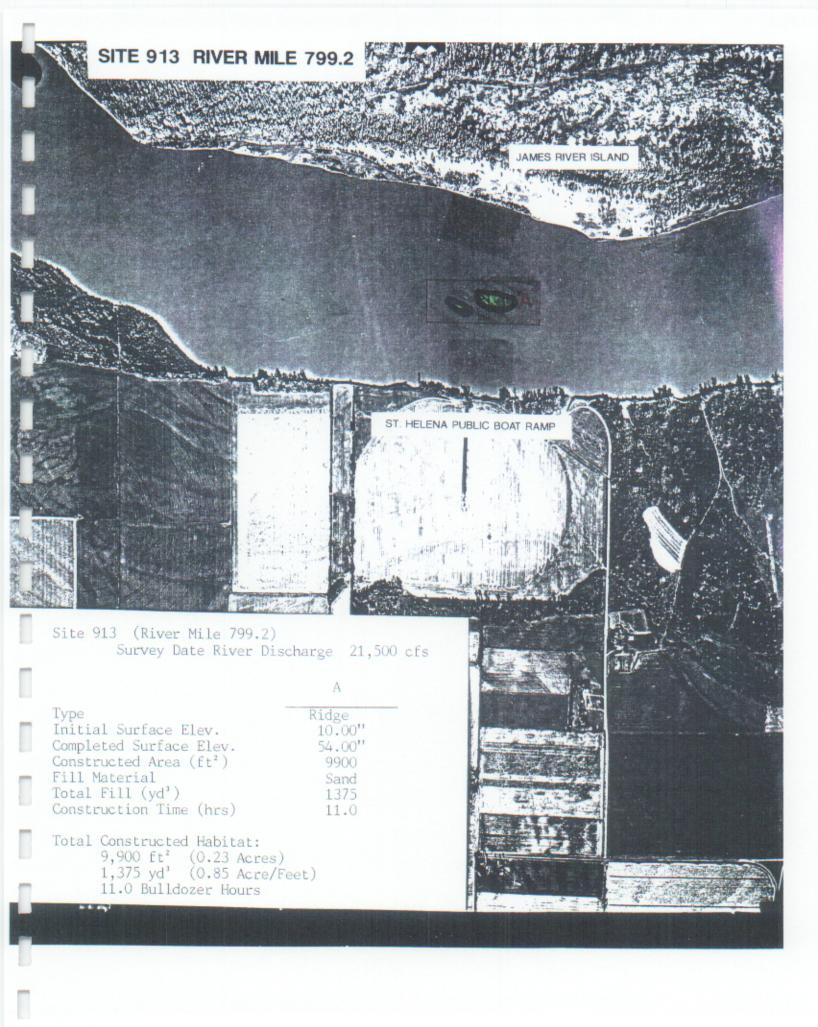
Note:

(1) A double layer of shoreline erosion arrestor (S.E.A.) bags were placed on the upstream side of constructed island A. See diagram on following page (marked in orange) for location.









NOT TO SCALE

9,900 ft2 1,375 yd3



River Mile 804.5, Site A, Ron Freng, heavy equipment operator, CEMRO-OP-LC makes an initial cut.



River Mile 804.5, Site A, site nearing completion. Note open end box shape with back water bay opening on downstream edge.



River Mile 804.6, Site C, Neil Andersen, heavy equipment operator CEMRO-OP-LF, brings a wet load up top.



River Mile 804.6, Site C, Neil Andersen CEMRO-OP-LF (foreground), Ron Freng CEMRO-OP-LC, and Duane Blair CEMRO-OP-MR finish up on a cold Friday morning.



River Mile 803.8, Site A. Island surface taking on a natural contour after only one day of strong wind.



River Mile 804.6, Site B. Completed island located on low elevation point. Island is shaped like a wedge with the point on the upstream side.



River Mile 8Q3.8, Site B. Newly completed island surface, dozer ridges and tracks were quickly scoured away by wind.



Substrate of many of the constructed islands, coarse to very course sand.